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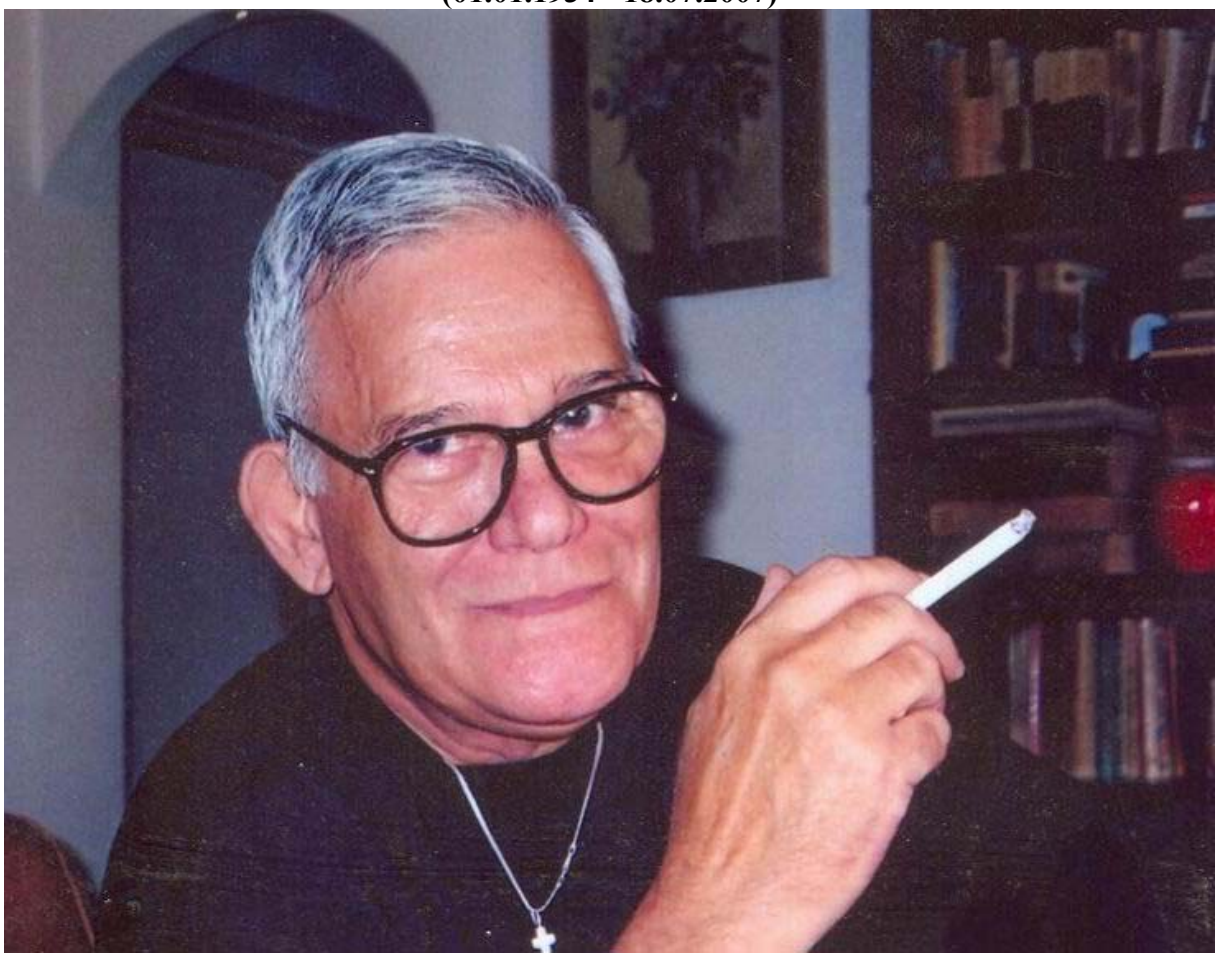
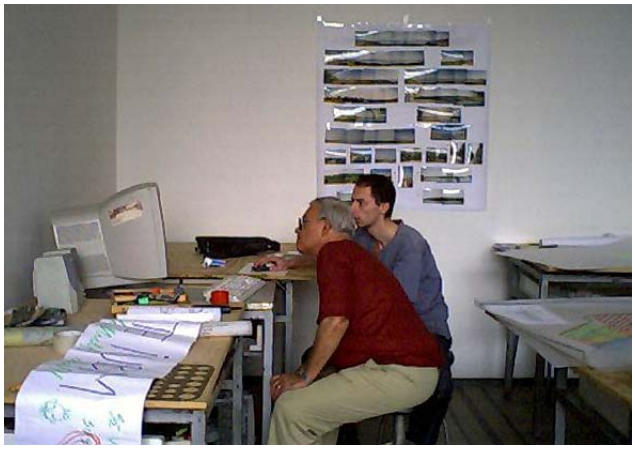
PLENARY SESSION

In memoriam FLORIN TEODOSIU
(01.01.1934 - 18.07.2007)



Numele Florin Teodosiu figurează în ”cartea de aur” a profesorilor secţiei de Peisagistică a Facultăţii de Horticultură din cadrul Universităţii de Ştiinţe Agricole şi Medicină Veterinară Bucureşti, unde a devenit pentru studenţii săi un adevărat prieten şi profesor.

Alături de d-na prof. dr. Ana-Felicia Iliescu şi de dl. arh. Valentin Donose, Florin Teodosiu a fost promotor al primei şcoli de peisagistică din România în cadrul USAMV Bucureşti, unde a devenit profesor asociat încă de la înființare, în 1998. Domeniul predilect de predare a fost planificarea peisajului (peisagistică teritorială), ramură introdusă de el prima dată la noi in țară, nu numai în învățământ şi cercetare, dar şi în practică.



În şcoala noastră, participând la formarea a 5 promoții de peisagişti, cu pasiune, entuziasm, talent oratoric şi pedagogic, deosebit simț practic şi lipici la studenți şi colegi, şi-a transmis ştiința şi interesul pentru peisagistică în general, şi pentru peisagistica teritorială şi restaurarea parcurilor şi grădinilor istorice în special – domenii în care mulți absolvenți lucrează deja, în practică sau cercetare. În şcoala de peisagistică a avut o muncă de pionierat, inițiind studenții atât în proiectarea grădinilor şi parcurilor, cât şi în restaurarea celor istorice şi în planificarea peisajului, într-o vreme când nicăieri în facultățile din România nu se pregăteau specialişti peisagişti şi nicăieri în țară nu existau specialişti în peisagistica teritorială.

Florin Teodosiu, absolvent al singurei promoții (1957) a secției „Spații verzi” din Facultatea de Silvicultură, Universitatea Transilvania din Braşov şi-a consacrat întreaga activitate domeniului peisagistic. Printre funcțiile îndeplinite,

se pot aminti cele de şef de şantier de spații verzi şi şef de birou de proiectare la Întreprinderea Horticola 1 Mai din Bucureşti, şef de proiect şi şef de colectiv de proiectare la Institutul Urban Proiect din Bucureşti şi la Institutul Carpați Proiect Bucureşti.

Înainte de a deveni unul dintre dascălii studenților noştri, inginerul Florin Teodosiu era un nume deja cunoscut în România. De-a lungul activității sale a muncit fără preget, a creat grădini şi a îmbogățit sufletul oamenilor cu frumusețea crâmpeielor de natură tratate artistic, a făcut lucruri importante pentru arhitectura peisajului şi patrimoniul peisagistic din România. Din vasta sa experiență profesională amintim amenajările importante proiectate şi realizate ca şef de colectiv:

- Amenajări peisagistice în zonele reprezentative şi în zonele aferente dotărilor urbane în oraşele Brăila, Hunedoara, Piatra Neamț, Piteşti etc
- Amenajări peisagistice în stațiunile Mamaia, Eforie, Neptun.
- Parcurile TIGLINA – Galați, CAPELA – Râmnicu Vâlcea, GRĂDIŞTE – Slatina, CENTRAL – Bistrița, OSTROV – Călimăneşti, CIUPERCA – Tulcea, CETĂȚII – Alba Iulia s.a.
- Restaurarea parcurilor palatelor Cotroceni şi Peleş.
- Amenajarea peisagistică a ansamblului monumentelor BRÂNCUŞI – Târgu Jiu (în colaborare cu Olin Comp. Phyladelphia).
- În străinătate: parcurile CENTRAL – Damasc, AL SWANII – Libia, UNIVERSITATEA BATNA – Algeria.
- Amenajări peisagistice în numeroase grădini private din țară şi din străinătate.

Şi în domeniul cercetării peisagistice a avut multe contribuţii, printre care studii şi cercetări de mare interes, în calitate de şef de program:

- Normative şi instrucţiuni tehnice pentru proiectarea şi executarea spaţiilor verzi.
- Studiul parcurilor şi grădinilor istorice din România (pentru I.C.O.M.O.S – U.N.E.S.C.O.).
- Cercetare privind influenţa spaţiilor verzi asupra mediului înconjurător (în colaborare cu Institutul de Igienă Bucureşti).
- Cercetare privind metodologia, metodele şi indicatorii de evaluare a calităţii mediului din localităţile urbane.
- Studiul teritorial al Judeţului Vâlcea, studii-pilot pentru implementarea unei metodologii ecologistico-peisagistice.
- Soluţii urbanistice şi teritoriale pentru protecţia mediului înconjurător (în colaborare cu Institutul Urbion – Bratislava).
- Capitolele „Peisagistica” şi „Glosar de Termeni” din cadrul Codului Urbanismului.
- Studiul de fundamentare Zone naturale protejate pentru Legea Amenajării Teritoriului Naţional.
- Capitolul "Zone Naturale Protejate" din cadrul Planului de Amenajare a Teritoriului Naţional.

Recunoaşterea muncii sale i-a adus premii şi distincţii:

- 1968 – Premiul Uniunii Arhitecţilor din România pentru staţiunea Neptun (în colectiv).
- 1971 – Premiul I la concursul pentru amenajarea lacului Cernica.

- 1992 – Premiu la concursul de urbanism "zona bisericii Sfântu Gheorghe, Bucureşti"
- 1995 – Premiul I la concursul "Restaurarea şi valorificarea parcului Carol I Bucureşti".

Florin Teodosiu a fost membru a numeroase asociații şi comisii dintre care amintim: Uniunea Arhitecților din România (din 1996), ECLAS (Consiliul European al Şcolilor de Arhitectura Peisajului), Comisia Națională a Monumentelor Istorice - Parcuri istorice (în cadrul Ministerului Culturii şi Cultelor, care l-a atestat expert în restaurarea monumentelor istorice). A fost întemeietorul Asociației Peisagiştilor în 2004 a activat cu entuziasm ca preşedinte până la sfârşitul vieții sale. Din această poziție a inițiat demersurile pentru adoptarea unei legislații naționale cu privire la peisaj şi peisagism.

De asemenea, Florin Teodosiu şi-a asumat cu generozitate responsabilitatea de susținător al tinerilor peisagişti, sprijinindu-şi constant foştii studenți în găsirea de locuri de muncă în domeniul în care s-au format.

Florin Teodosiu – omul, era caracterizat prin bunătate şi toleranță, iubire față de aproapele. Pentru farmecul său, vorba de duh, veşnica țigară, toate atributele prezenței sale, cuvintele de învățătură în ale vieții şi profesiei, colegi şi studenți deopotrivă l-am prețuit şi l-am iubit. Respectat pentru cultura, experiența, generozitatea şi idealismul, Florin şi-a atras admirația tuturor celor care l-au cunoscut.

În urma sa a lăsat un gol atât în sufletele noastre, cât şi în schema didactică a secției de peisagistică.

Dumnezeu să-l odihnească în cealaltă lume,
în cea mai frumoasă grădină, a Raiului!

Lucrări ştiinţifice U.Ş.A.M.V.B., Seria B, vol. L, 2007

RESEARCHES REGARDING THE EFFECTS OF THE WINTER CHANGES IN TEMPERATURE ON THE BUDS AT SOME FRUIT TREES SPECIES

HOZA D., ION LIGIA, ASANICA A.

Keywords: *peach tree, apricot tree, sweet cherry tree, plum tree*

SUMMARY

The high increase in temperature registered in the Winter of 2006/2007 affected the stone fruit species. The loss registered at apricot tree was between 52,9 and 68,8% depending on the variety and peach tree 49,5-55,8% destroyed buds. A bigger loss was registered at cherry tree (32,5-34,1) and plum tree (24,1-31,4). At each species the most affected part was the inferior part of the crown.

The climatic changes in the last few years and especially the temperatures ones from the Autumn/Winter period influence the winterizing of trees and their resistance to the unfavourable conditions of Winter. The majority of the stone fruit trees species have a short biological rest, which makes them more sensitive to the action of temperature change. In the past years, the periods with temperatures over the biological limit in January and February were frequent and that led to a decrease in the trees resistance. When the cold came back, there was registered important loss of buds with direct implications on fruit production. The present study is based on this particular fact, analyzing the reaction of trees and especially of buds regarding the temperature changes.

MATERIAL AND METHOD

The observations and determinations were done in the Spring of 2007 in the didactic field of Pomology Department, at 4 species with great influence on the south part of the country: peach tree, apricot tree, cherry tree, plum tree. From the specie were chosen representative varieties as it follows:

- Apricot tree: Dacia, Comandor, Excelsior, Selena, Mamaia, Favorit;
- Peach tree: Redhaven, Filip, Florin, NJC 108;
- Cherry tree: Pietroase de Cotnari, Van;
- Plum tree: Centenar, Stanley, Ialomiţa, Renclod Althan.

The trees are mature, aged between 9 and 11, depending on specie. The crown shape used was the vase bush and the planting distance was of 4/3 at peach tree, plum tree and apricot tree and of 4/2 at cherry tree. There were done determinations regarding the destruction through frost percentage, the capacity of production in natural conditions and the production of fruits obtained.

RESULTS AND DISCUSSIONS

The species and varieties have had different behaviour depending on their genetic features as it is proved below.

Regarding the loss of buds through frost, generally, as average data, the biological tolerance of species was respected, but great loss was registered at cherry tree and plum tree, species which in normal conditions do not suffer during the winter.

At apricot tree, the loss registered at the 6 varieties studied was of 63,25% lost buds, with a maximum of 68,8% at Selena and a minimum of 52,9% at Comandor (fig.1). Analyzing the loss per tree, the first 2 m on the crown high suffered a bigger loss than the superior part, the values varying between 9,3% at Dacia and 25,3% at Favorit.

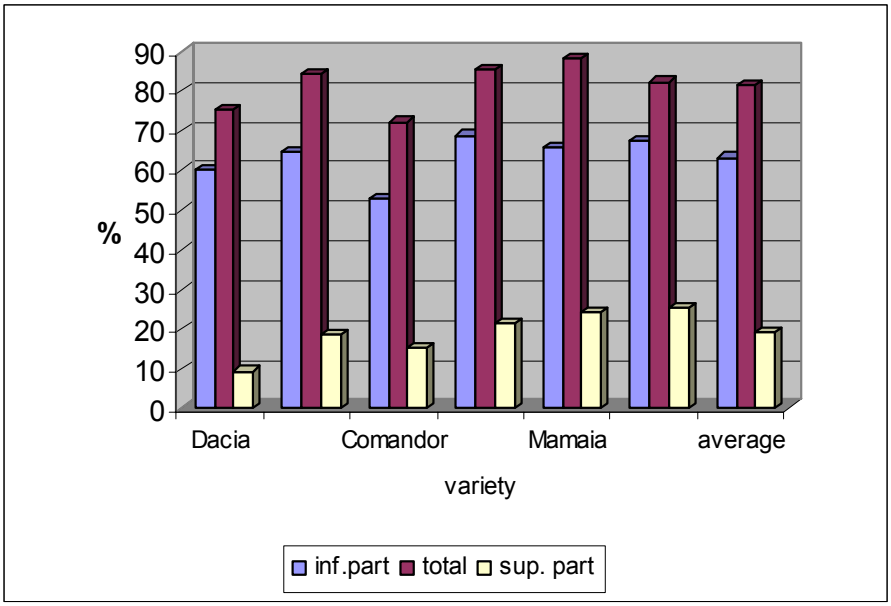


Fig. 1 The destroyed buds at apricot tree (%) (%)

The huge changes in temperature and the winter windows from February also affected the peach tree. At the 4 nurseries studied the average loss of buds was of 50,98%, varying between 46,2% at Redhaven and 55,8% at Florin. The inferior half of the crown was more affected, the values registering an increase of 19% over the specie average value (fig. 2). Important loss was registered also in the superior part of the crown, the average per variety reaching a value over 23% lost buds. They do not great importance at this specie, but they prove the consequences of thermal changes.

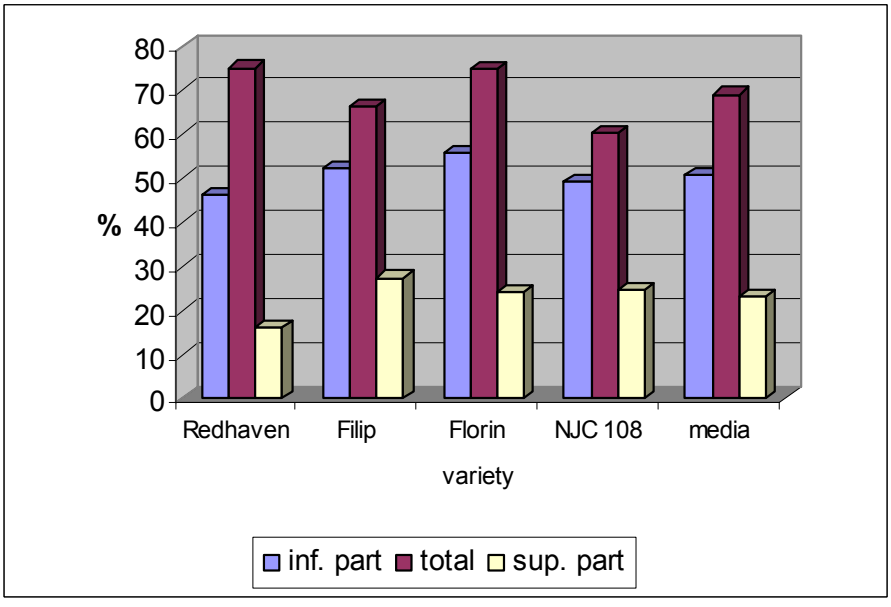


Fig. 2 The distroyed buds at peach tree (%)

At cherry tree, a specie which normally do not suffer during winter was registered a loss of 33,3%, with over 48% destroyed buds on crown. This fact shows that although the cherry tree has a longer rest period, an increase in temperature modifies the normal progress of buds development. From the studied varieties, Van was more tolerant than Pietroase de Cotnari (fig. 3).

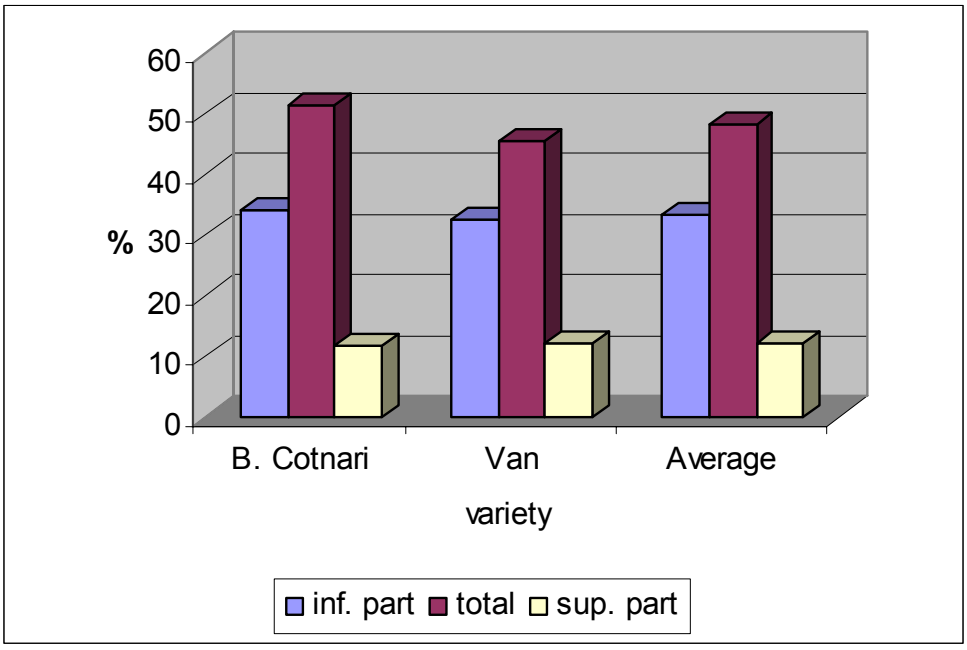


Fig. 3 The distroyed buds at cherry tree (%)

In this study were also analyzed 4 varieties of plum tree. The average values of loss was of 26,85%, with a maximum of 40,42% for the inferior part of the crown. Between varieties, the most tolerant was Stanley with 24,1% destroyed buds, opposing Renclod Althan with 31,4% destroyed buds (fig. 4). The superior part of the crown suffered small loss.

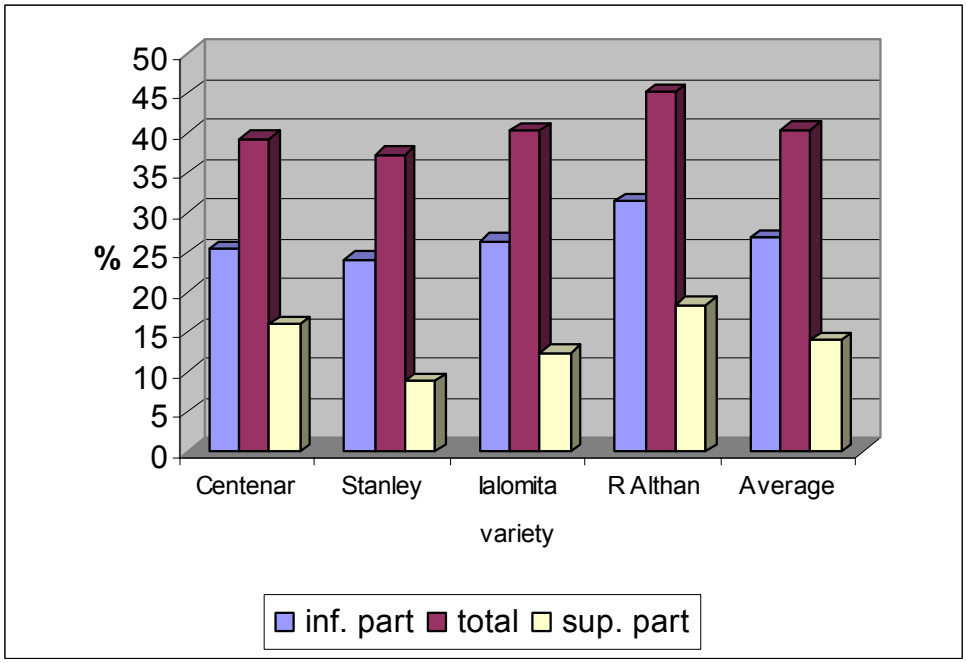


Fig. 4 The distroyed buds at plum tree (%)

Regarding the process of fruits forming the problems were registered at cherry tree and plum tree (fig. 5, 6).

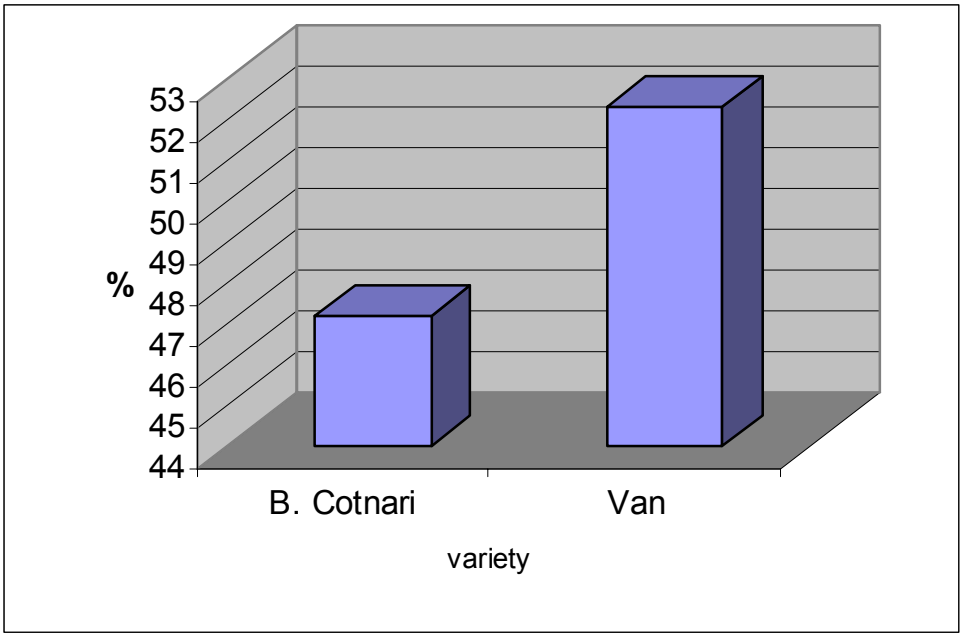


Fig. 5 The percentage of formed fruits at some cherry tree varieties

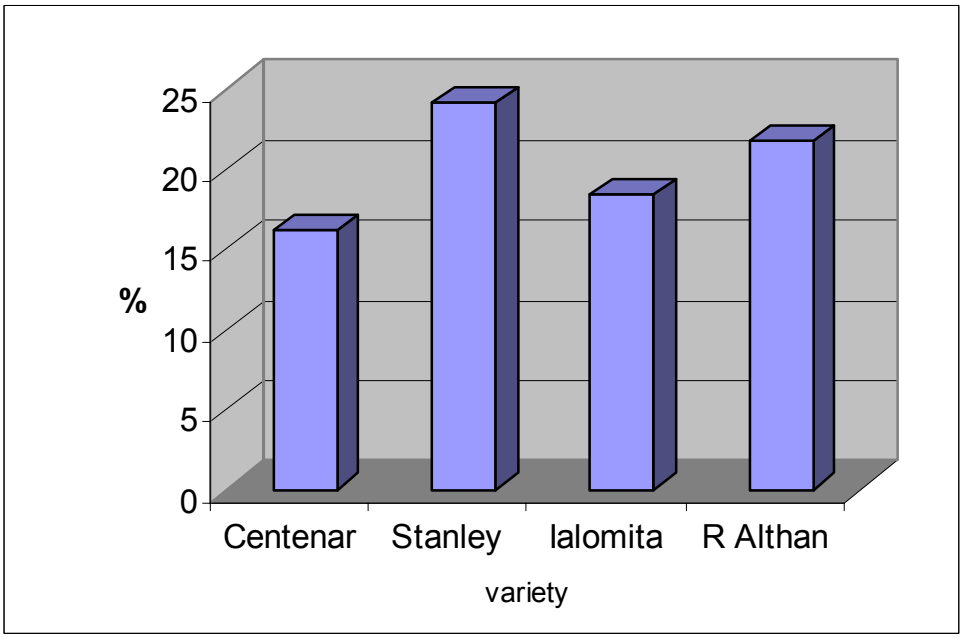


Fig. 6 The percentage of formed fruits at some plum tree varieties

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THE EFFECTS OF ACCENTUATED CLIMATIC VARIABILITY OVER THE VINE CULTURE

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Keywords: climatic modifications, grapevine, growth, yield, quality

ABSTRACT

The climatic modifications of the last decade have significantly influenced both the growth and the fructification of the grapevine, and the grapes yield and its quality. During the last years there have been recorded very hot periods during the summer, a fact that determined a defective fruit set (2002), a more reduced growth of the berries, an acceleration of the phenological stages (flowering, berries growth, maturity), the harvesting of the grapes being preceded with up to two weeks. Also, there have been recorded increased accumulations of sugars in the grapes, outrunning with 30 g/l (2003) the values obtained during normal years. The hydric stress was frequently manifested both through deficit of precipitations (the case of long periods within the interval 2001-2003), as well as of the surplus (September-October 2003 and the entire year 2005). The outlined deficit of precipitations within the interval July 2001-June 2002, determined very weak vegetative growth that haven't been seen during the last decades, a fact that led to obtaining of reduced size grapes, with small berries, the normal subsequent water supply leading to increased sugar accumulations. Pursuant to these changes there have also been recorded differentiated distributions of the dry matter between the various organs of the vines. These modifications must be taken into account when zoning the varieties, when applying the various cultural techniques for improving the yield quality.

INTRODUCTION

The vine culture proved to be a sensitive indicator of the climatic modifications that influence the production, the quality, the pressure of the pathogen agents, the development of the phenological stages, the area of economical culture of the varieties of high quality.

The knowledge regarding the impact of the climatic modifications over the vine culture is relatively less, comparing with those referring to the annual plants of culture.

It is well known in viticulture the relation that exists between the quality of the yield and the meteorological conditions of the culture year. The viticultural regions of Europe, that produce wines of high quality, are circumscribed to some narrow areas with very favourable climatic conditions for the maturation of different varieties of grapes.

The vine culture is directly influenced by the increase of CO_2 concentration in the atmosphere. It is appreciated that a doubling of CO_2 concentration – the main gas responsible for the hothouse effect, shall lead to the photosynthesis intensification with approximately 30% according to the variety and to the environment conditions, but it shall also lead to the increase of the biomass production with 15-20% and of the efficiency of using water with 10%.

It was noticed lately an outrunning of the phenological stages development with 1-2 weeks for bud break and blossoming and with 2-3 weeks – the veraison and the maturation of grapes.

The present paper is examining the modifications noticed with respect to the temperatures of the air, the hours of sun brightness, the precipitations from the growing season of the last years as well as of the main synthetic indicators with which the viticulture operates the extreme phenomena and the conduit of the vine culture under these conditions.

MATERIALS AND METHODS

The researches have been performed during the period 2000-2006, in the experiment plantation of the Department of Viticulture and Enology from the University of Agronomic Sciences and Veterinary Medicine Bucharest. The plantations has been set up in the year 1995 with the variety Royal Feteasca, with the clone 21 Bl, grafted on the Kober rootstock 5BB, with distances of plantation of 2,2/1,2m.

It has been studied the type of cut spur pruned cordon with three bud loads: 10, 15 and 20 bud/m^2.

The determinations performed took into account the quantity of pruning wood eliminated at the cut (kg/stock), the grapes' yield (kg/stock), the concentration of saccharin of the must when cropping the grapes (g/l), the titrable acidity (g/H_2 So_4).

For the calculation of the dry matter, the quantity of wood eliminated at the cut and the grapes' yield have been increased with the coefficients 0,5 and respectively 0,2.

The dry matter of the leaves was calculated with the help of the formula "m^2 leapt surface x 65g/ m^2".

RESULTS AND DISCUSSIONS

1. The climatic variability. Following the average annual temperatures from the last 7 years, comparatively with the multi-annual ones (table 1), there are noticed overcomes of the value of 11.0^0C in 4 years: 2000 and 2004 (11.6^0C); 2005 (11.2^0C) and 2006 (11.1^0C).

During the growing period, there were registered monthly average temperatures with higher values for longer periods, and namely: May – August 2000; May – July 2002; May – August 2003 and 2007.

The annual precipitations registered high variations from one year to another (table 2), contained between 379.1 mm (2000) and 1109.0 mm (2005), comparatively with the multi-annual data (567.7 mm). A reduced quantum of precipitations was registered in the interval October 2001 – May 2002, with only 141.2 mm, representing 40% from the normal values. Other intervals with significant deficits of precipitations were in January – February and April – June 2003.

Neither the excesses of precipitations have missed; therefore, in the interval September – October 2003 were registered 429.7 mm with respect to 83.5 mm normal values (representing an increase of more than 5 times), as well as the interval July – October 2005, with a total of 663 mm in comparison with 192.7 mm normal values (representing an increase of 3.5 times).

Taking into account the simple and complex climatic indicators, used currently in viticulture (table 3), it is noticed an increase of the average temperature from the hottest month (July or August) to 23.5^0C in the experimenting period, in comparison with 22.9^0C – normal values, of the duration of sunshine (Σ ir) to 1594 hours, comparatively with 1557, of the real heliothermic index (IHr) to 2.58 in comparison with 2.44. Substantial increases were also noticed with respect to the deficit of precipitations (DP) from the interval May – August (period that interests the irrigated culture of the vine) to 135 mm, comparatively with 99 mm, as well as to the index of the oenoclimatic aptitude of the production of red wines (IAOe) to 4799, with respect to 4694.

2. The influence of the annual climatic conditions over the vegetative elements of the grapevine. As a consequence of the variability of the climatic conditions from one year to another, the vegetative growths, the leaf surface and the accumulation of dry matter in the annual organs of the vine registered high variations, according to the hydric and the heliothermic regime (table 4). Following the accentuated deficit of precipitations from the

interval October 2001 – May 2002, the pruning wood registered much reduced values. Therefore, annual quantity of wood removed at pruning at the end of the year 2002 was of only 0.295 kg/vine, comparatively with the values from the other years, of 1.1-1.3 kg/vine.

In the figure 1 it is presented an aspect of the experimenting plantation from the winter 2002/2003, with much reduced growth, arriving only to the second floor of the supporting wires.

The values of the leaf surface were also reduced of only 1.73 m^2/vine, comparatively with 3-4 m^2/vine in the other years of culture.

The dry matter accumulated in the annual organs of the vine (wood, leaves and grapes) in the year 2002 totalized, in average, 1070 g/vine, representing less than half from the values of a very favourable year for viticulture (2006).

3. The distribution of dry matter accumulated in the annual organs of the vine.

The dry matter accumulated annually by the vine is divided differently between the vegetative organs (annual wood, leaves) and the fructification ones (grapes).

A multitude of factors influence this distribution of dry matter: the variety, the pedo-climatic conditions (mainly the fertility of the soil and the water content), the distances of plantation, the green operations, the irrigation, the fertilization, etc.

In the figure 2, it is presented the percentage distribution of the dry matter between different annual organs of the vine (wood, grapes and leaves).

Therefore, in the year 2003, when in the interval January – June was registered a quantum of precipitations of approximately 45% from the normal values, the dry matter accumulated in the pruning wood represented 28% from the total, the grapes' yield possessed the highest share (62%), and the leaves 10%. A relatively similar situation was noticed also in the year 2006, considered a very favourable year both for quantity and for quality: 27% in wood, 62% in grapes and 11% in leaves. In exchange, the year 2005, with a pronounced excess of precipitations, favoured a greater accumulation of dry matter in the wood (45%), in leaves (17%) and smaller in the grapes (38%).

4. The influence of the annual climatic conditions over the yield on quantitative and qualitative aspect.

The yield of grapes has varied in large limits, according to the year of culture: from 2.596 kg/vine in an unfavourable year (2005) to 7.284 kg/vine in a very favourable year (2006). From table 5, it is noticed the fact that the grapes' yield in 2002 and 2003, characterized as droughty years and with thermal excess in the period May – June, the grapes' yield was less affected in comparison with the annual growth. Especially in the year 2002, it was noticed a defective fruits set, the average weight of the grape was of only 59.6 g, and the berries remained of small dimensions (the weight of 100 berries being of 123 g).

The accumulation of sugar was stimulated by the climatic warming and the hydric deficit from 2002, 2003 and 2007, arriving, in average, to 192.7 g/l (2002), 197.2 g/l (2003) and 203.8 g/l (2007) similar with a very favourable year for quality (2006), when were accumulated 193.1 g/l.

In exchange, the titratable acidity of the must at the harvest of the grapes registered deficit values, as a consequence of outrunning the phenological stage of maturation of the grapes, the combustion of the organic acids being more intense at higher values of temperature.

CONCLUSIONS

The climate warming accentuated in the last decade has influenced positively the quality of grapes allowing the acquirement of superior wines.

The anticipated maturation of the grapes, in conditions of higher temperature, makes necessary a correction of the deficit acidity of the musts.

The great frequency of the periods with excess of precipitations during the growing period involves the application of some additional fitosanitary treatments, by increasing the production costs.

It is necessary an adaptation in the future of the agrofitotechnic measures to the specific conditions of the year of culture. Therefore, according to the water content of the soil in the spring, it shall be correctly dimensioned the bud load attributed at pruning, it shall be appreciated the opportunity of application of some green operations (the reduction of the number of shoots and inflorescences), or of some works of conservation of the water from the soil.

The zoning work of the grapevine varieties admitted in culture in the viticultural areas from Romania must be updated taking into account also the climatic modifications that will allow the extension of the North limit of culture of the black varieties.

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Tables

Table 1. The temperature of the air – monthly averages (^{0}C) (Bucureşti – Filaret)

Year	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	Average
1901-2000	**-2.2**	**-02**	**5.3**	**11.6**	**16.9**	**20.7**	**22,9**	**22.4**	**17.7**	**11.8**	**5,5**	**0.4**	**11.0**
2000	-4.8	1.8	5.6	14.0	17.8	21.6	24.0	23.4	15.5	10.1	7.9	2.5	11.6
2001	0.7	1.9	7.1	10.0	17.3	18.6	23.2	23.3	17.0	11.8	3.1	-4.0	10.8
2002	-2.8	4.4	7.7	9.5	17.9	21.8	23.8	20.8	15.8	9.9	6.6	-5.2	10.8
2003	-1.6	-3.5	0.9	10.5	21.0	22.5	23.3	25.2	16.2	6.9	3.2	-6.1	9.9
2004	-2.6	1.7	7.2	12.3	15.8	20.1	22.8	21.4	17.6	12.9	7.0	2.6	11.6
2005	1.7	-1.2	4.6	11.6	17.5	19.5	22.5	21.8	17.2	11.7	5.1	2.1	11.2
2006	-3.2	-1.5	4.8	11.8	16.6	21.0	22.6	22.3	17.7	12.9	5.9	2.6	11.1

Table 2. Monthly precipitations (mm) (Bucureşti - Filaret)

Year	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	Annual sum
1901-2000	**39.5**	**33.3**	**38.1**	**46.0**	**68.1**	**85.5**	**59.2**	**50.0**	**40.6**	**42.9**	**47.8**	**41.4**	**567.7**
2000	37.3	34.5	32.6	50,7	37.7	34.8	38.2	7.5	81.2	1.2	1.4	5.0	379.1
2001	17.4	52.4	77.0	39.2	19.1	139.9	35.2	26.8	36.3	6.4	2.8	21.0	492.5
2002	14.3	17.3	21.9	25.8	9.7	108.2	92.0	35.2	57.9	84.5	6.7	70.2	606.2
2003	15.0	4.0	51.1	35.5	17.5	19.0	90.6	3.0	205.2	224.5	7.5	70.0	814.9
2004	37.1	20.2	34.5	15.6	108.4	52.8	58.8	92.5	27.6	22.4	65.9	46.2	582.0
2005	63.0	61.0	31.6	17.0	99.5	90.7	125.8	105.4	316.5	115.3	50.9	32.3	1109.0
2006	40.5	15.7	34.8	20.8	54.5	76.4	65.4	60.6	36.8	34.5	85.0	37.3	562.3

Table 3. Climatic indicators

Climatic index	1901-2000	2000	2001	2002	2003	2004	2005	2006	Average 2000-2006
Average year temperature (ºC)	**11.0**	11.6	10.8	10.8	9.9	11.6	11.2	11.1	11.0
Average temperature from the growing period (^{0}C)	**18.2**	18.6	18.1	18.5	19.4	17.6	17.8	18.2	18.3
Average temperature of the hottest month (VII-VIII) (^{0}C)	**22.9**	24.0	23.3	23.8	25.2	22.8	22.5	22.6	23.5
Length of the growing season (days)	**201**	200	190	180	181	211	200	202	195
Active thermic balance (Σ^0 t a)	**3667**	3726	3444	3328	3511	3721	3564	3675	3567
Useful thermic balance (Σ^0 t u)	**1657**	1726	1544	1528	1701	1611	1564	1655	1618
Sum of the hours of real insolation (Σ ir)	**1557**	1850	1629	1413	1735	1483	1481	1568	1594
Sum of the annual precipitations (mm)	**567.7**	379.1	492.5	606.6	814.9	582	1109	562.3	650
Sum of the precipitations from the growing period (mm)	**370**	251	283	353	429	378	840	340	410
Real heliothermic index (IHr)	**2.44**	3.19	2.51	2.15	2.95	2.38	2.31	2.59	2.58
Hydrothermic coefficient (CH)	**1.00**	0.67	0.82	1.06	1.22	1.01	2.35	0.92	1.15
Deficit of precipitations (DP-mm)	**99**	270	129	122	301	104	-78.3	96	135
Viticultural bioclimatic index (Ibcv)	**8.67**	13.70	10.43	7.40	7.80	6.90	3.14	8.39	8.25
Index of the oenoclimatic aptitude(IAO_e)	**4694**	5308	4896	4685	5073	4569	4258	4803	4799

Table 4. The vegetative elements of the vine according to the climatic conditions of the year of culture (Fetească regală, 2002 - 2006)

Specification	Bud load (bud/m^2)	2002	2003	2004	2005	2006
Pruning weight (kg/vine)	10	0.252	0.890	0.860	1.110	1.152
	15	0.258	1.014	1.330	1.306	1.188
	20	0.375	1.384	1.712	1.465	1.428
	Mean	**0.295**	**1.096**	**1.300**	**1.293**	**1.256**
Leaf area (m^2/vine)	10	1.64	3.25	2.37	3.45	2.85
	15	1.66	3.35	2.53	3.67	4.17
	20	1.90	4.04	3.14	3.65	4.36
	Mean	**1.73**	**3.54**	**2.68**	**3.59**	**3.79**
Total dry matter accumulated in the annual organs (kg/vine)	10	832	2252	1381	1261	2172
	15	1037	2253	1696	1461	2165
	20	1340	2020	1894	1474	2656
	Mean	**1070**	**2175**	**1657**	**1398**	**2331**

Table 5. Yield of grapes according to the quantitative and qualitative aspect depending on the climatic conditions of the year of culture (Fetească regală, 2002 - 2007)

Specification	Bud load (bud/m^2)	2002	2003	2004	2005	2006	2007
Yield (kg/vine)	10	3.000	4.070	3.179	2.411	7.057	2.935
	15	4.040	5.140	3.236	2.852	6.500	3.018
	20	5.190	5.270	3.977	2.525	8.295	4.067
	Mean	**4.076**	**4.826**	**3.464**	**2.596**	**7.284**	**3.340**
Average weight of a grape (g)	10	64.8	89.1	63.1	71.5	144.2	88.6
	15	57.9	96.1	51.3	65.1	146.8	98.1
	20	56.3	82.9	49.5	56.5	151.7	83.6
	Mean	**59.6**	**89.3**	**54.6**	**64.3**	**147.6**	**90.1**
Weight of one hundred berries (g)	10	110.6	156.0	186.3	170.7	183.2	135.8
	15	128.6	173.1	173.5	161.8	177.1	131.6
	20	130,0	149,5	158.2	167.5	180.8	152.6
	Mean	**123.0**	**159.5**	**172.6**	**166.6**	**180.3**	**140.0**
Sugar (g/l)	10	192.2	1937	164.2	176.3	188.8	203.7
	15	196.6	2006	171.0	174.3	194.3	201.8
	20	189.5	197.3	162.8	169.8	196.3	206.0
	Mean	**192.7**	**197.2**	**166.0**	**173.4**	**193.1**	**203.8**
Acidity (g/l H_2SO_4)	10	3.48	3.52	6.14	6.29	4.86	3.99
	15	3.53	3.21	5.88	5.97	4.96	4.11
	20	3.43	3.28	5.83	5.88	4.91	3.95
	Mean	**3.48**	**3.33**	**5.95**	**6.04**	**4.91**	**4.02**

Figures

Fig. 1. The aspect of the weak growth from the experimental plantation after one year of accentuated drought (February 2003)

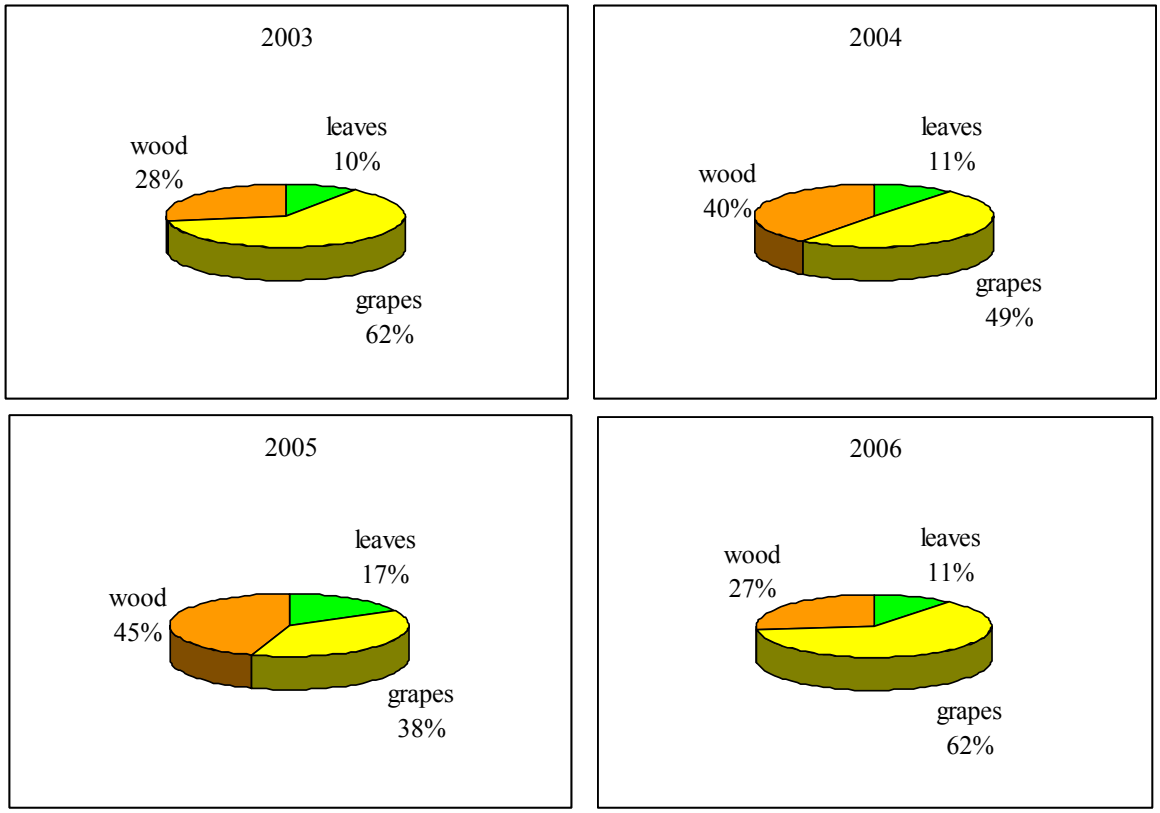


Fig. 2. The distribution of the dry matter between different annual organs of the vine (Fetească regală, 2003-2006)

Mi presento

- Nicola Dalmonte
  - Vivaista
  - Italia
  - Romagna
  - Brisighella

Dalmonte Guido e Vittorio Vivai

- **E’ dal 1895 che i Vivai Dalmonte fanno crescere l’agricoltura professionale**
- **Una società giovane (età media dei soci 41 anni) che però ha alle spalle oltre un secolo di esperienza**

Con la propria attività di conservazione e supporto alla certificazione, nel 2004 il CAV ha sviluppato insieme alla propria base sociale le seguenti produzioni vivaistiche:

Astoni certificati	n. 2.856.433
Portinnesti certificati	n. 8.690.095
Innesti certificati	n. 6.552.000
Innesti di base	n. 13.000
Piante madri di base	n. 1039
Portinnesti di base	n. 170.321
Piante orticole qualificate	n. 178.810.819

centro attivita` vivaistiche

Oggi non è possibile fare

frutticoltura senza un filiera

organizzata

centro attivita` vivaistiche

Il vivaismo

- Parte della filiera (sistema frutticolo)
- Settore strategico
- Dove c'è una frutticoltura forte c'è anche un vivaismo forte

(senza un vivaismo avanzato non c'è frutticoltura moderna)

- Anticipa le tendenze
- Gli errori in vivaio si pagano a lungo

Il successo di un frutteto deriva da molti fattori:

- tecnica agronomica
- difesa fitosanitaria
- ambiente pedoclimatico
- qualità del materiale vivaistico
-Scelta varietale (innovazione)
-Sperimentazione (valutazione)

centro attivita` vivaistiche

Il vivaista

- Il vivaista moderno è disponibile ad accogliere le esigenze del cliente (frutticoltore)
- Servizi
- Tipologie di pianta
- Garanzie
- Fornisce innovazione al cliente
- *la combinazione di questi fattori definisce un prodotto "di qualità"*

Qualità del materiale vivaistico: significa

- conformazione della pianta
- rispondenza genetica
- rispondenza sanitaria

centro attivita' vivaistiche

DALMONTE
Guido e Vittorio

Servizi

non si fermano alla vendita del materiale vegetale, infatti forniamo anche

- Consulenza alla progettazione
- Assistenza pre-impianto
- Realizzazione degli Impianti

DALMONTE
Guido e Vittorio

Innovazione

- La frutta “si mangia con gli occhi”
- significa che:
  - deve essere attraente
  - deve essere ben presentata
- Prima di tutto la qualità si fa nel campo
  - dopo dobbiamo mantenerla

Come sceglie le varietà il vivaista?

- Risposta teorica:
  - Secondo quanto chiede il mercato

- In pratica:
  - Conoscenza costante e diretta di tutti i fattori che condizionano la scelta del cliente

DALMONTE
Guido e Vittorio

Come scegliere la varietà

- Premesso che:

- *La varietà perfetta non esiste*
- *Scegliere significa fare una selezione*

- PRODUTTIVA costantemente
- RUSTICA (resistente alle malattie e alle manipolazioni)
- AMBIENTATA
- TESTATA
- GARANTITA

La qualità del materiale vivaistico da un punto di vista genetico e sanitario,
è raggiungibile attraverso la
“Certificazione”

centro attivita` vivaistiche

Garanzie

- Anche ciò che non è certificato può essere buono , la differenza è **:"essere in grado di comprovarlo"**
- *I mercati sono sempre più aperti*
- *Chiedono informazione*
- *Chiedono sicurezza*
- *Si tratta di documentare ,"tracciare", ciò che facciamo*

Cos’ è la certificazione?

(risposta formale)

È una procedura tecnico - legislativa cui viene sottoposto il materiale di propagazione per l’accertamento e il mantenimento dello stato sanitario e della corrispondenza varietale

centro attivita` vivaistiche

Cos' è la certificazione?

(in sostanza)

- **Cosa significa?**
- Garanzia e informazione
- **Perché è indispensabile Certificare?**
- Perché alcune malattie delle piante sono incurabili, l'unica forma di difesa è la prevenzione.
  - L'errore più grave per un frutticoltore è partire con materiale ammalato

centro attivita' vivaistiche

Chi rilascia la certificazione?

La certificazione è rilasciata dal
Ministero delle Politiche Agricole
(in sostanza da un ente “super partes”

centro attivita` vivaistiche

centro attivita' vivaistiche

Certificazione

- **Sanitaria** =
  - difesa e prevenzione dalle malattie (incurabili)
- **Genetica** =
  - corrispondenza varietale =
  - certezza di ciò che moltiplichiamo\vendiamo\acquistiamo=
  - no a truffe o frodi

Certificazione sanitaria

- Alcune malattie sono INCURABILI
- Prevenire è fondamentale e doveroso
- Partire male compromette il risultato
- La certificazione non può fare miracoli, ma tiene lontani i mali evitabili

Certificazione genetica

- Quante volte abbiamo sentito che di una varietà ci sono “più tipi”?
- Questo genera confusione!
- Questo genera perdite di tempo e denaro
- Con la certificazione abbiamo la certezza (e la possibilità di verificarlo) che ciò che compriamo corrisponde ad un “modello depositato”

Conclusioni

- CERTIFICAZIONE =
- E’ lo strumento migliore per
- Difendere gli investimenti:
  - Dei breeder
  - Dei frutticoltori
  - Di noi vivaisti
- **il reddito e il lavoro di tutti**

Conclusioni

- Per sviluppare la frutticoltura è fondamentale partire da piante sane e geneticamente garantite
- Il successo di un sistema frutticolo si otterrà solo con lo sforzo coordinato dei tanti partner coinvolti
- Grazie per l'attenzione

INFO

Centro Attività Vivaistiche

Nurseryman consortium

Bucarest 2 nov 07

www.cavtebano.it

centro attivita` vivaistiche

centro
attivita`
vivaistiche

CAV

Region:

Emilia Romagna

MEMBER

CAV'S MEMBER

CIV
CONSORZIO ITALIANO VIVAISTI

CO.VI.F. ER.

MIVA

COVIRO

CONSORZIO ORTOVIVAISTI ITALIANI

centro attivita` vivaistiche

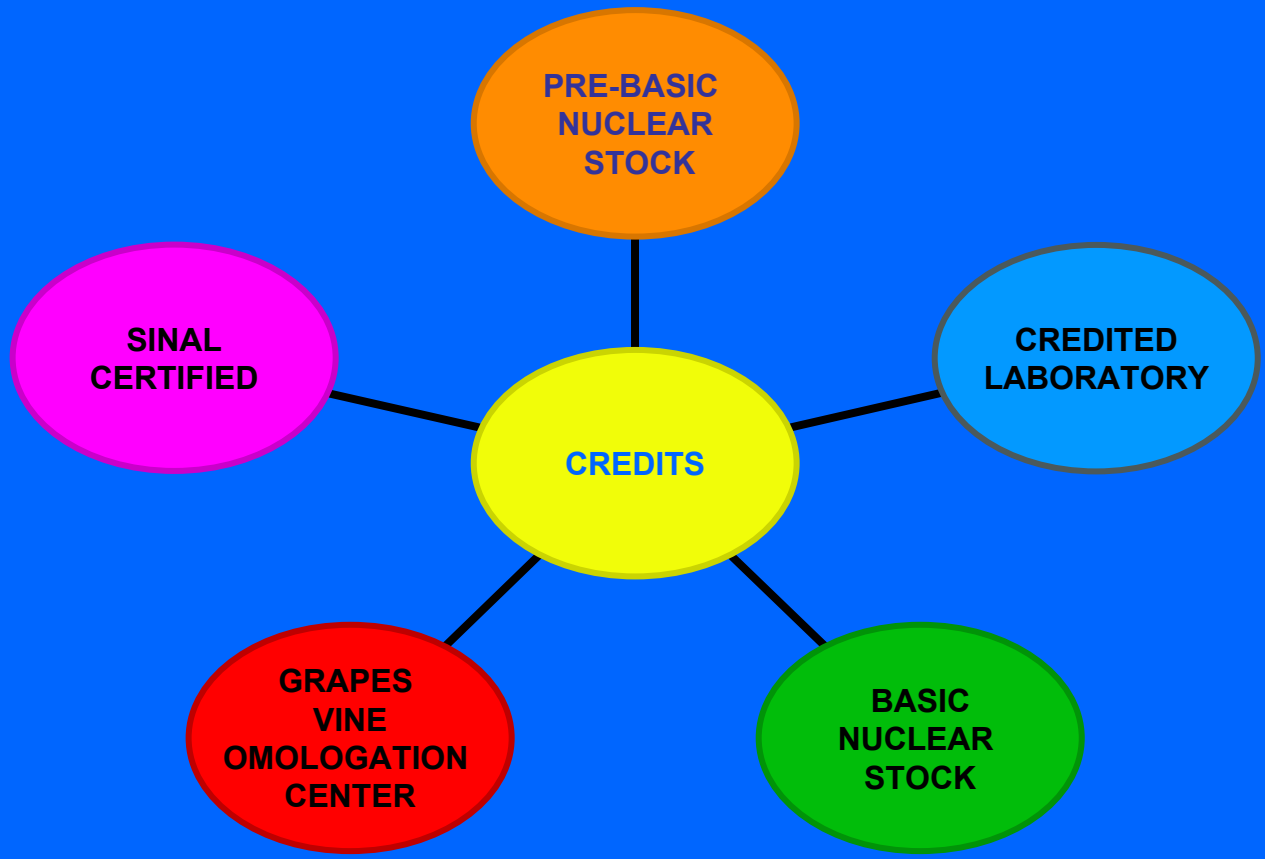
VITIS Rauscedo

C.E.M.I.
CENTRO MOLTIPLICAZIONE ITALIANO

OSAS
ORTOFRUTTICOLA

COVER

CREDITS


PRE-BASIC NUCLEAR STOCK
SINAL CERTIFIED
CREDITED LABORATORY
CREDITS
GRAPES VINE OMOLOGATION CENTER
BASIC NUCLEAR STOCK

MINISTERO DELLE POLITICHE AGRICOLE e FORESTALI

DECRETO 24 LUGLIO 2003

Organizzazione del Servizio Nazionale di Certificazione Volontaria del materiale di propagazione vegetale delle piante da frutto.

CREDITS

Ministry of Agriculture

C. A. V.

(ACCCREDITETED NUCLEAR STOCK CENTRE AND LABORATORY)

Multiplication centre

CAV'S associated

CAV' S nursery associted

CONTROLS IN PROCESS

Ministery of agriculture

C. A. V.

(ACCCREDITETED NUCLEAR STOCK CENTRE AND LABORATORY)

Self control and

Control by Phytosanitary pubblic service

Multiplication centre

CAV'S associated

Self control by CAV and

Control by Phytosanitary pubblic service

CAV' S plants certificated

THE PROCESS

New variety

C. A. V.

(ACCCREDITETED NUCLEAR STOCK CENTRE AND LABORATORY)

Autorisation by

Ministery of agricolture

Inscription in Ministery Register

Nuclear stock (into screen house)

Pre basic plants

Premultiplication

Premultiplication

basic plants

Nursery

certificated plants

Articolazione del Servizio Nazionale di certificazione

SISTEMA DI CERTIFICAZIONE

FILIAZIONE DIRETTA

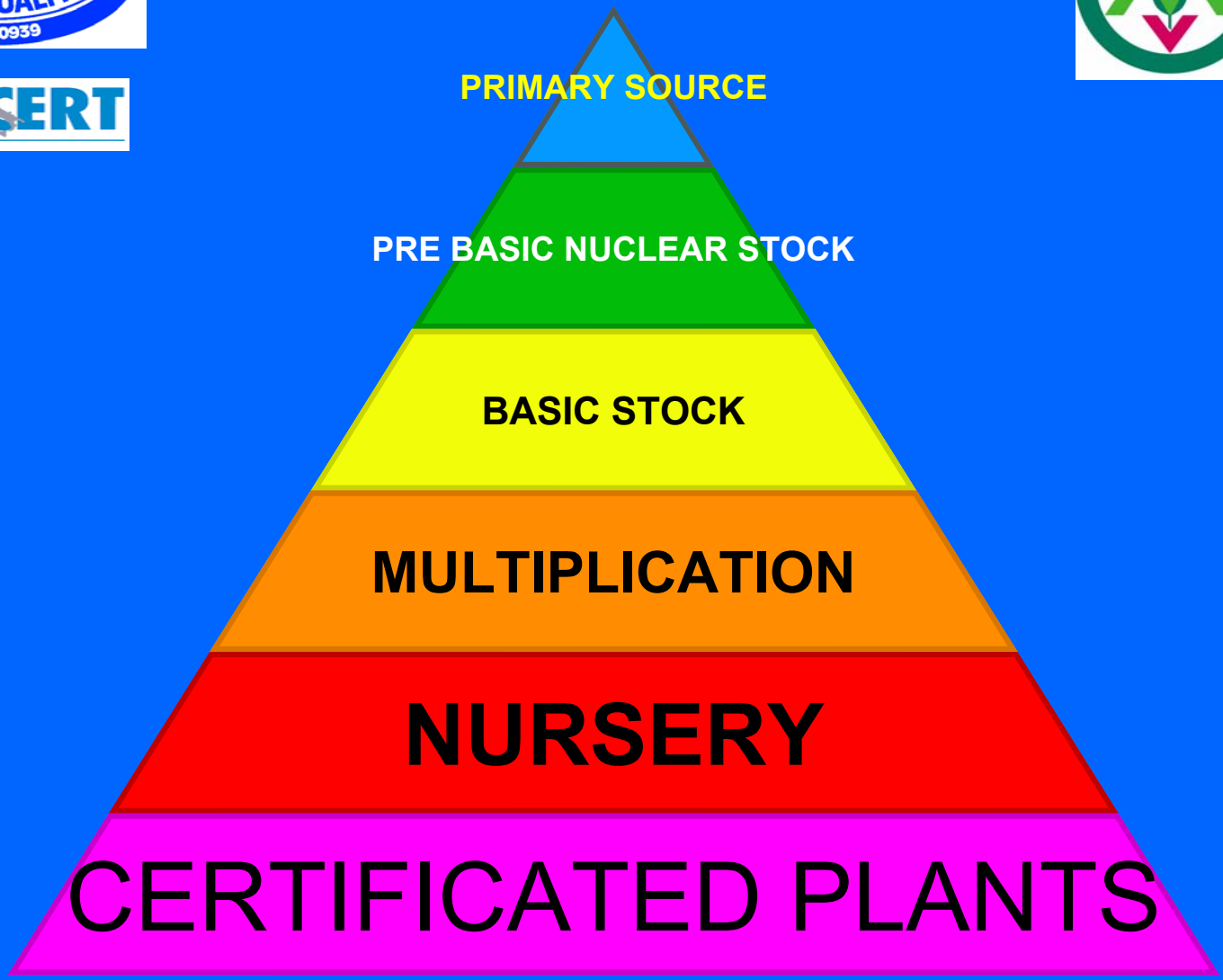
Fasi	Struttura	Categoria dei materiali di propagazione
Conservazione per la premoltiplicazione	Centro di Conservazione per la premoltiplicazione	Prebase
Premoltiplicazione	Centro di Premoltiplicazione	Base
Moltiplicazione	Centro di Moltiplicazione → Vivaio	Certificato

PALNTS CERTIFICATION PROCESS

RINTRACCIABILITÀ DI FILIERA
CERTIQUALITY
UNI 10939

SINCERT

centro attivita` vivaistiche



D.D.M.M 20 Novembre 2006

Norme tecniche per la produzione di materiali di moltiplicazione certificati di agrumi, fragola, olivo, prunoidee e pomoidee

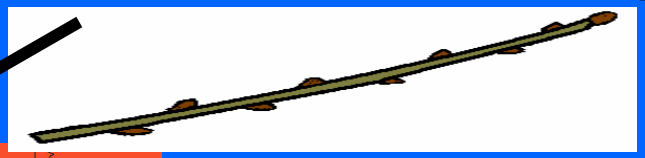
Scheda fitosanitaria

Parte B - Protocolli dei saggi effettuati per l'accertamento dello stato sanitario

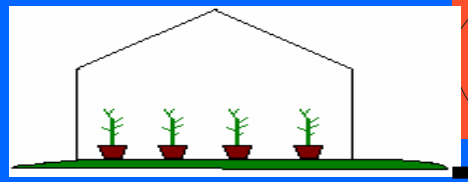
B.1 Albicocco					
Agente eziologico / Malattia	**Acronimo**	**Saggi biologici (indicatori arborei)**		**Test Microscopici / Sierologici** + -	**Test Biomolecolari** + -
		+ **Serra** -	+ **Campo** -		
VIRUS					
Virus del mosaico del melo *Apple mosaic virus*	**ApMV**	☐ *Prunus persicae* ☐ GF305 o Elberta	☐ *Prunus persicae* ☐ GF305 o Elberta ☐ *P. armeniaca* Priana ☐	☐ ELISA ☐	☐ RT-PCR ☐ ☐ Ibridazione ☐
Virus della maculatura clorotica fogliare del melo *Apple chlorotic leaf spot virus*	**ACLSV**	☐ *Prunus persicae* ☐ GF305 o Elberta	☐ *Prunus persicae* ☐ GF305 o Elberta ☐ *P. armeniaca* Priana ☐	☐ ELISA ☐	☐ RT-PCR ☐ ☐ Ibridazione ☐
Virus della maculatura anulare necrotica dei *Prunus* *Prunus necrotic ring spot virus*	**PNRSV**	☐ *Prunus persicae* ☐ GF305 o Elberta ☐ *Prunus serrulata* ☐ cv. Kwanzan o Shirofugen	☐ *Prunus persicae* ☐ GF305 o Elberta ☐ *Prunus serrulata* ☐ cv. Kwanzan o Shirofugen	☐ ELISA ☐	☐ RT-PCR ☐ ☐ Ibridazione ☐
Virus del nanismo del susino *Prune dwarf virus*	**PDV**	☐ *Prunus persicae* ☐ GF305 o Elberta ☐ *Prunus serrulata* ☐ cv. Kwanzan o Shirofugen	☐ *Prunus persicae* ☐ GF305 o Elberta ☐ *Prunus serrulata* ☐ cv. Kwanzan o Shirofugen	☐ ELISA ☐	☐ RT-PCR ☐ ☐ Ibridazione ☐
Virus associato al la butteratura e necrosi della corteccia del susino *Plum bark necrosis stem pitting – associated virus*	**PBNSPaV**				☐ RT-PCR ☐ ☐ Ibridazione ☐
Virus latente dell'albicocco *Apricot latent virus*	**ALV**	☐ *Prunus persicae* ☐ GF305 o Elberta	☐ *Prunus persicae* ☐ GF305 o Elberta ☐ *P. armeniaca* Priana ☐		☐ RT-PCR ☐ ☐ Ibridazione ☐
Virus della vaiolatura delle drupacee o Sharka *Plum pox virus*	**PPV**	☐ *Prunus persicae* ☐ GF305 o Elberta	☐ *Prunus persicae* ☐ GF305 o Elberta ☐ *P. armeniaca* Priana ☐	☐ ELISA ☐	☐ RT-PCR ☐ ☐ Ibridazione ☐

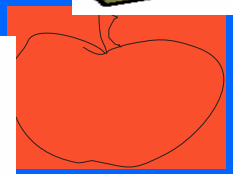
A: varietà geneticamente stabili

Fonte primaria accertata



Screen H.

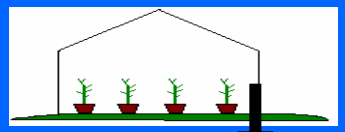


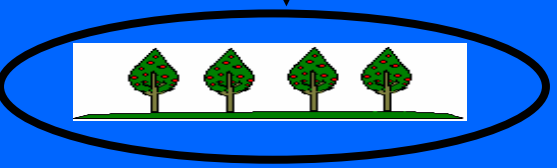


Premolt. pieno campo

1 controllo fruttificazione

Premolt. in screen





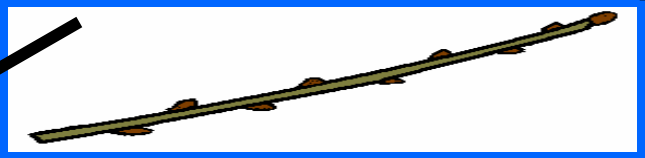
piante di monitoraggio

marzai su ptn vigorosi

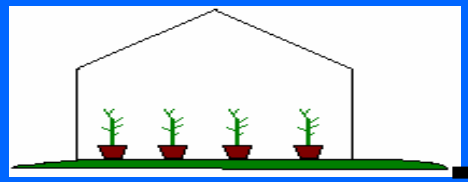
marze per il vivaio

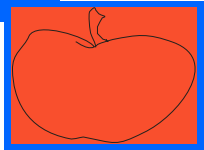
B: varietà geneticamente instabili

Fonte primaria accertata



Screen H.

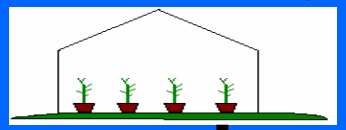


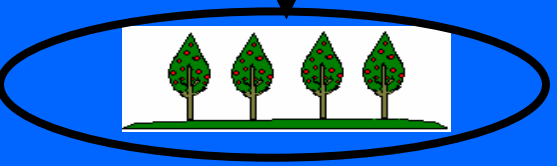


Premolt. pieno campo

1 controllo fruttificazione

Premolt. in screen

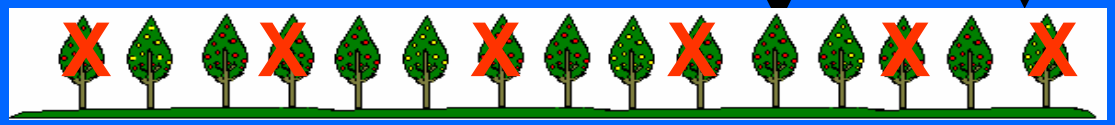


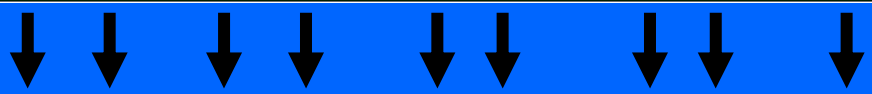


piante di

monitoraggio

marzai su M9





marze per il vivaio

ASTONI CERTIFICABILI 2007/08

Attivitá SFR		N° vivai	melo	pero
Puglia		4	73.000	/
Calabria		2	/	4.000
Veneto	Emilia R.	1	195.000	/
	Veneto	30	547.000	597.000
	P.A. TN	8	890.000	/
	P.A. BZ	13	2.668.000	8.000
Emilia Romagna		69	609.000	1.841.000
Lombardia	P.A. BZ	3	412.000	/
Totali		130	**5.394.000**	**2.450.000**

TRACEABILITY

CAV'S CERTIFICATION (BY MINISTERY OF AGRICOLTURE) IS THE WAY TO ASSURE:

- **GENTICS IDENTITY**
- **HEALTH GUARANTEE**
- **TRACEABILITY**

CAV's traceability system get all the information to farmers, collect center and fruit operators

LABEL

cav
Ministero delle Politiche Agricole e Forestali - ITALIA
Servizio nazionale di certificazione volontaria
Regione Emilia-Romagna Servizio Fitosanitario Regionale
varietà: GOLDEN DELICIOUS CLONE B
portinnesto: M9 T337
QUALITÀ CE
Categoria: Certificato
VIRUS ESENTE - VF
PASSAPORTO DELLE PIANTE CEE
CODICE FORNITORE: FE 0498
SPECIE: Malus x Domestica
Anno di Produzione: 2006
vale per 1 pianta
ZP
309
N. 2694850 F
CIVI - ITALIA
CAV
Ministero delle Politiche Agricole e Forestali
Servizio nazionale di certificazione volontaria
Regione Emilia-Romagna - Servizio Fitosanitario Regionale
cultivar: SELVA ®*
(varietà brevettata)
QUALITÁ CE
Categoria: Certificato
VIRUS ESENTE – VF
Vale per N° PIANTE
Passaporto delle piante CEE
Specie: FRAGARIA x ANANASSA
49
Codice Fornitore: RA 3013
Anno di produzione: 2006
N° 170741

Traceability certification

CERTIQUALITY

ISTITUTO DI CERTIFICAZIONE DELLA QUALITÀ

ALLEGATO AL CERTIFICATO / *ENCLOSURE TO CERTIFICATE* N. **P 368**

SOGGETTI INSERITI IN FILIERA:

COVIFER – ERRANO DI FAENZA (RA)
CIV – S.GIUSEPPE DI COMACCHIO (FE)
COOPERATIVA AGRICOLA BRACCIANTI – CERVIA (RA)
COVER – LUGO (RA)
CTV – CESENA (FC)
VIVAI COOP. ANSALONI – SAN LAZZARO DI SAVENA (BO)
DALMONTE G e V – BRISIGHELLA (RA)
VIVAI MAZZONI – TRESIGALLO (FE)
VIVAI TAGLIANI – OSTELLATO (FE)
SALVI VIVAI – FERRARA (FE)
CALDERONI VIVAI – SOLAROLO (RA)
GEOPLANT VIVAI – SAVARNA (RA)
VITROPLANT – CESENA (FC)
ROSATTI GENNARO – S.VITO DI OSTELLATO (FE)
TAMPIERI MAURO – OSTELLATO (FE)
MACCANTI VIVAI – DOGATO DI OSTELLATO (FE)
BATTISTINI VIVAI – MARTORANO DI CESENA (FC)
CONVI – BRISIGHELLA (RA)

SCOPO ED ELEMENTI OGGETTO DI RINTRACCIABILITA':

STATO FITOSANITARIO; COSTITUZIONE DELLA FONTE; CONSERVAZIONE; PREMOLTIPLICAZIONE; MOLTIPLICAZIONE; VIVAIO

PRIMA EMISSIONE* *FIRST ISSUE** 21/12/2005

EMISSIONE CORRENTE *CURRENT ISSUE* 21/12/2005

CERTIQUALITY S.r.l.

SINCERT

CERTIQUALITY S.r.l. ISTITUTO DI CERTIFICAZIONE DELLA QUALITÀ
Via Gaetano Giardino 4 - 20123 Milano - tel. 02 80691.71 - fax 02 86465295 - certiquality@certiquality.it
www.certiquality.it

centro attività vivaistiche

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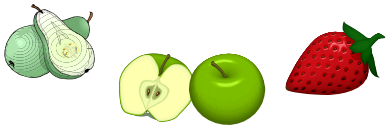
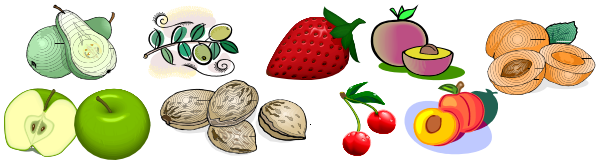
CCP Centro sper. Laimburg - Bolzano

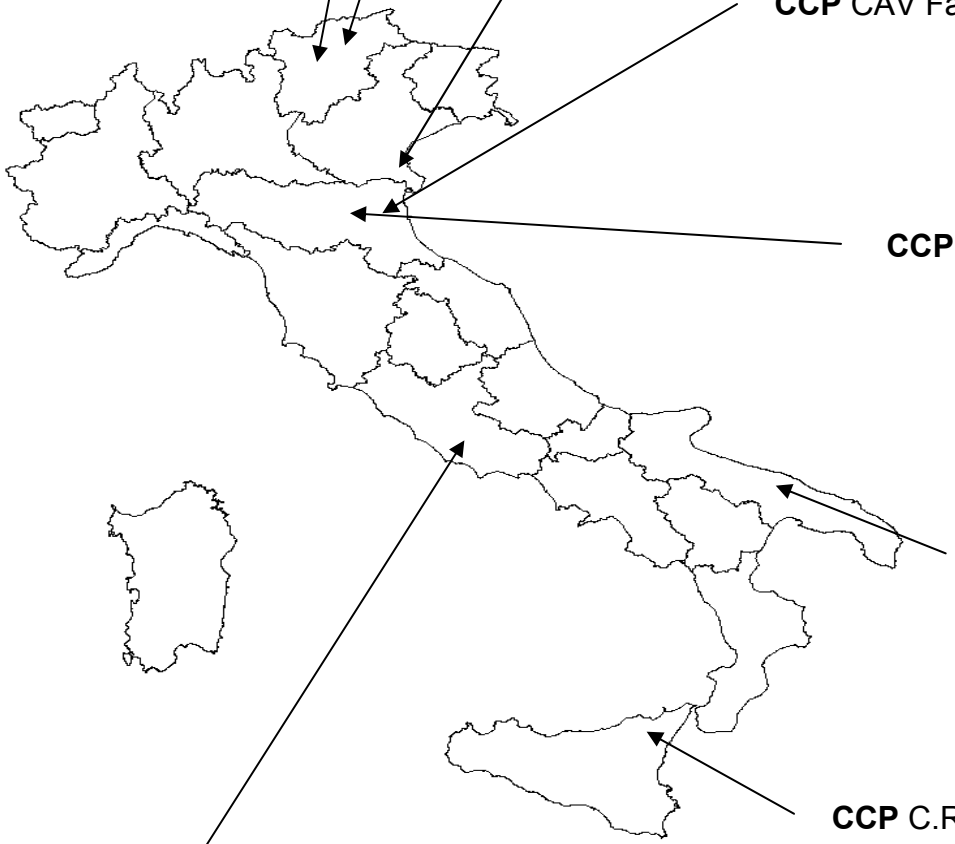
CCP Ist. Agr. San Michele all'Adige - Trento

CCP Centro sper. "Pradon" Porto Tolle - Reg. Veneto



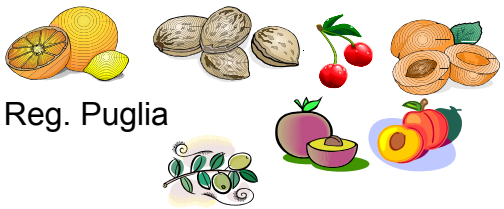
CCP CAV Faenza - Reg. E. Romagna



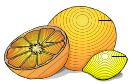


CCP C.R.A. ISF Forlì - Reg. E. Romagna

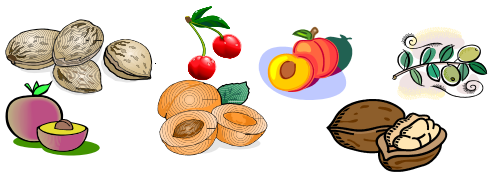
CCP DPPMA UBA - Reg. Puglia



CCP C.R.A. ISA Acireale - Reg. Sicilia

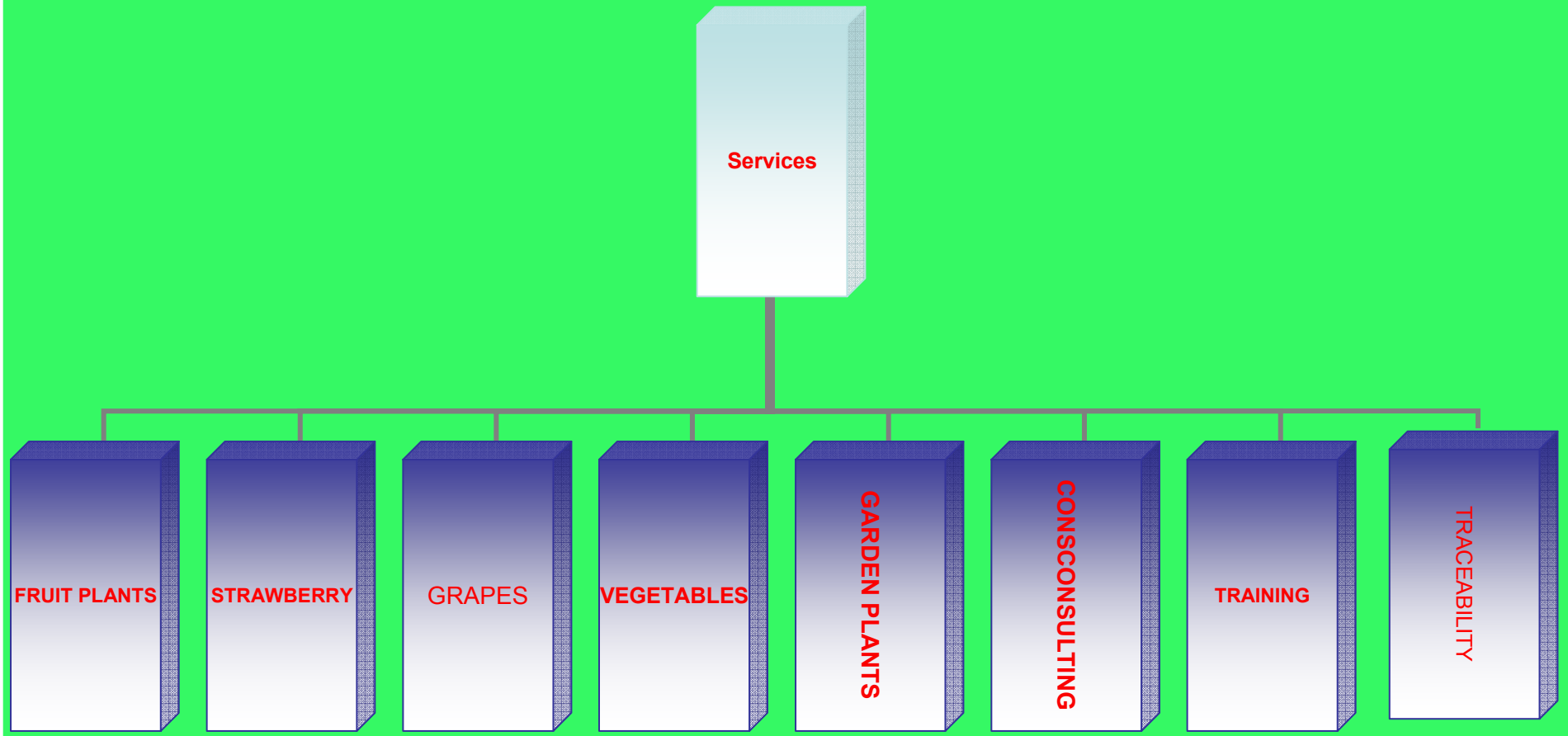


CCP C.R.A. IsPaVe Roma - Reg. Lazio



Centri di Conservazione per la Premoltiplicazione

SERVICES


Services
FRUIT PLANTS
STRAWBERRY
GRAPES
VEGETABLES
GARDEN PLANTS
CONSCONSULTING
TRAINING
TRACEABILITY

FRUIT PLANTS

RINTRACCIABILITÀ DI FILIERA
CERTIQUALITY
UNI 10939

SINCERT

centro attività vivaistiche

FRUIT PLANTS SERVICES

FRUIT PLANTS

- Primary source make
- Diagnosys
- Index
- Termotherapy
- Pre-basic nuclear stock
- Basic nuclear stock
- Basic Material productions
- Plants Certification Assistence

RINTRACCIABILITÀ DI FILIERA CERTIQUALITY UNI 10939

SINCERT

centro attivita' vivaistiche

FRUTTIFERI

-Costituzione fonte primaria

- Verifiche sanitarie

- Saggi biologici

- Termoterapia

- Conservazione per la premoltiplicazione

- Premoltiplicazione

- Produzione materiale cat. BASE

- Immissione fonti nel sistema di certificazione

- Assistenza alla certificazione (etichette, raccolta dati ecc).

RINTRACCIABILITÀ DI FILIERA CERTIQUALITY UNI 10939

SINCERT

centro attivita` vivaistiche

LABORATORY

Ministery Credits of our laboratory

VIRUS, MLO

BACTERIA

FUNGI

INSECTS

ON ALL PLANTS KIND AND CATEGORY

centro attivita' vivaistiche

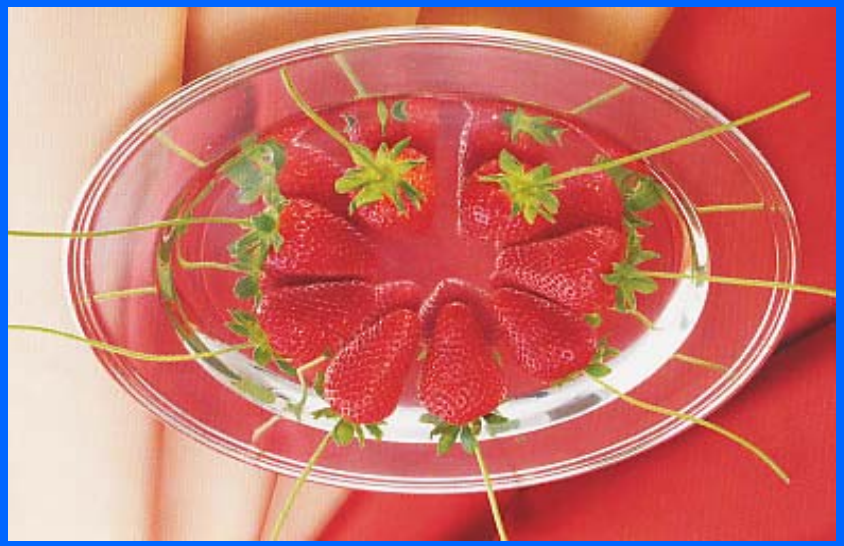
STRAWBERRY

RINTRACCIABILITÀ DI FILIERA
CERTIQUALITY
UNI 10939

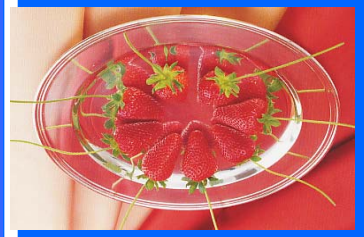
SINCERT

centro attività vivaistiche

STRAWBERRY SERVICES



STRAWBERRY



- Primary source make
- Diagnosys
- Index
- Termotherapy
- Pre-basic nuclear stock
- Basic nuclear stock
- Basic Material productions
- Plants Certification Assistence

RINTRACCIABILITÀ DI FILIERA CERTIQUALITY UNI 10939

SINCERT

centro attivita` vivaistiche

GRAPS WINE

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GRAPES WINE SERVICES

GARPES WINE

- Diagnosys services

- Index

- Termotherapy

- Homologation new cultivar

-Nuclear stock storage

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Rules in certification process

- Breeder / editor
- Nuclear stock
- Premultiplication center
- Multiplication center
- Nursery
- Phytsanitary Pubblic Service

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CERTIFICATION SCHEME

NUCLEAR STOCK CENTRE REQUIREMENTS

Pre-basic material has to be stored and propagated in strict isolated conditions

Isolated at least one kilometre from any pome or stone fruit tree

They have to be realised with a double insect-proof net

CERTIFICATION SCHEME

Documents and procedures

-The request to introduce a new variety by the breeder and/or the licensee.

- The application form has to be presented to the Ministery of agricolture and CAV accompanied by the result of laboratory tests in accordance with protocols and by the UPOV form (and/or the UE patent form) to describe the cultivar's pomological characteristic.

-The Nuclear Stock manager must inform PPS of the result of phytosanitary tests and of any anomaly found on plants; he must follow prescriptions received by PPS in case of plants that not fulfil requirements.

CERTIFICATION SCHEME

NUCLEAR STOCK MANAGEMENT

Nuclear stock Centre has to conserve maps of its screen-houses with the exact place of any plant. It also has to record all data regarding transfer of pre-basic material.

In order to verify the true to type, three plants of each clone must be cultivated in open field and checked in accordance with protocol

CERTIFICATION SCHEME

PROPAGATION STOCK (Premultiplication Centre)

Premultiplication process produces basic material (buds, grafts, seeds, rootstocks, plants). It can be obtained with:

in vitro culture starting from pre-basic material;
agamic propagation grafting pre-basic buds on pre-basic rootstocks.

With a specific authorisation of PPS, the Premultiplication Centre can entrusts an in vitro lab with the task of in vitro propagation in accordance with the protocol (see Annex 3). In order to produce basic material it must be utilised the first five sub-culture only.

CERTIFICATION SCHEME

The Premultiplication Centre can be authorised by PPS to produce basic material on open field in cases of stoolbeds for rootstock

CERTIFICATION SCHEME

PREMULTIPLICATION MANAGEMENT

The Premultiplication Centre has to conserve maps of its screen-houses with the exact place of any plant. It also has to record all data regarding transfer of basic material.

To plant an open field stoolbed or mother tree stock the premultiplication Centre has to make an application to PPS enclosing documents of transfer of pre-basic material issued by an authorised Nucler Stock Centre, the plots maps and the result of soil tests for nematods.

CERTIFICATION SCHEME

PROPAGATION STOCK 2 (MOTHER TREE BLOCKS)

Propagation Stock 2 can be placed in farms directly managed by nursermen

Multiplication process produces **certified material** (buds, grafts, seeds, rootstocks, plants). It can be obtained with:

in vitro culture starting from basic material;

agamic propagation grafting basic buds on basic rootstocks.

Stoolbeds and Mother Tree Blocks (MTB) can be planted on open field and has to be found free from nematods.

Stoolbeds and MTB have to be isolated.

CERTIFICATION SCHEME

NURSERY MANAGEMENT

Nurserymen have to send the application form for new planted certified nursery to PPS by 30 june of each year enclosing:

documents of transfer of certified material issued by an authorised Stoolbeds, MTB or in vitro lab;

the plots maps with description of the number and type of rootstock planted in each row;

declaration of not cultivation of the plots with fruit tree in the last 4 years.

After inspections PPS issues a “Pass-mark document” to nurserymen and authorises CAV to stamp labels.

CERTIFICATION SCHEME

LABELLING

All material produced in certified nurseries must be labelled as follows:

- any kind of plants must be labelled one by one
- rootstocks produced in nursery in bunches of 10, 25, 50

PHYTOSANITARY TESTS IN APPLE

Name	
Apple mosaic virus	ApMV
Apple stem pitting virus	ASPV
Apple chlorotic leaf spot virus	ACLSV
Apple stem grooving virus	ASGV
Apple dimple fruit viroid	ADFVd
Apple scar skin viroid	ASSVd
Candidatus Phytoplasma mali (associato ad Apple proliferation)	AP
Erwinia amylovora	

PHYTOSANITARY TESTS IN APPLE

Name	*Sigla*
Apple rubbery wood (=*Apple flat limb*) (=*Apple chat fruit*)	ARW AFL ACF
Fruit desease	
Russet ring	ARRV
Green crinkle	GCV
Rough skin	ARSk
Star crack	ASC
Russet wart	ApRWa
Ring spot	ApRS

Phytosanitary tests on pre-basic and basic material

Nuclear stock and premultiplication
Aspects control (syntomps) every years

- All the nuclear stock and pre-multiplication plants has to be tested each 3 years

TESTS IN APPLE

VIRUS		Spy palnts	Time and test
Virus del mosaico del melo (*Apple mosaic virus*)	ApMV	*Malus pumila* Charden *Malus pumila* Golden Delicious *Malus pumila* Lord Lambourne	Fine inverno / primavera marze / foglie giovani Elisa, RT-PCR, RT-PCR-Elisa
Virus della butteratura del legno del melo *** (*Apple stem pitting virus*)	ASPV	*Pyronia veitchii* *Malus pumila* Spy 227 *Malus pumila* Virginia Crab *Malus pumila* Kola *Malus pumila* Radiant	Fine inverno / primavera marze / foglie giovani RT-PCR
Virus della maculatura clorotica fogliare del melo *** (*Apple chlorotic leaf spot virus*)	ACLSV	*Malus sylvestris* R12740 7A *Cydonia oblonga* C7/1 *Cydonia oblonga* Pigwa *Malus platycarpa*	Fine inverno / primavera marze / foglie giovani Elisa, RT-PCR, IC- RT-PCR
Virus della scanalatura del tronco del melo *** (*Apple stem grooving virus*)	ASGV	*Malus pumila* Virgiania Crab *Malus micromalus* GMAL273 *Pyronia veitchii*	Fine inverno / primavera marze / foglie giovani Elisa, RT-PCR, IC- RT-PCR RT-PCR- Elisa

TESTS IN APPLE

VIROIDI			
Viroide dell'infossatura crateriforme della mela *(Apple dimple fruit viroid)*	ADFVd	*Malus communis* Stark's Earliest *Malus communis* Sugar Crab *Malus communis* Delicious rosse *Malus communis* Starkrimson	Fine inverno / primavera marze / foglie / frutti RT-PCR, Ibridazione
Viroide dell'ulcerazione delle mele (*Apple scar skin viroid*)	ASSVd	*Malus communis* Stark's Earliest *Malus communis* Sugar Crab *Malus communis* Delicious rosse *Malus communis* Starkrimson	Fine inverno / primavera marze / foglie / frutti RT-PCR, Ibridazione
FITOPLASMI (MLO)			
Fitoplasma degli scopazzi del melo *Candidatus* phytoplasma mali)	AP	*Malus communis* Charden *Malus com.* Golden Delicious *Malus com.* Lord Lambourne	Estate /autunno marze / foglie IF, Elisa, DAPI, PCR- Elisa PCR
Colpo di fuoco batterico *Erwinia amylovora*			
Tumore batterico *Agrobacterium tumefaciens*			
Cancro rameale *Pseudomonas syringae pv syringae*			

TRACEABILITY

Traceability is a required for retailer and food industry

- Reg CE 178
- HACCP
- Standard BRC (UK)
- Standard IFS (F, D)
- EUREPGAP
- certification System (ISO 9001, ISO 22000)
- Supermarket

CAV's traceability system get all the information to farmers, collect center and fruit operators

TRACEABILITY

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Traceability certification

CERTIQUALITY

ISTITUTO DI CERTIFICAZIONE DELLA QUALITÀ

* La validità del presente certificato è subordinata a sorveglianza periodica non superiore a 1 anno e al riesame completo del Sistema di conformità del prodotto con periodicità triennale.

* *The validity of this certificate depends on the fulfilment of yearly surveillances and a triennial full review of the product certification System*

CERTIFICATO / *CERTIFICATE*

N. **P 368**

SI CERTIFICA CHE IL PRODOTTO / *WE HEREBY CERTIFY THAT THE PRODUCT*

INNESTI, PORTAINNESTI E ASTONI DI DRUPACEE E POMACEE

PIANTE DI FRAGOLA

DELL'ORGANIZZAZIONE / *OF THE ORGANIZATION*

C.A.V.
CENTRO ATTIVITÀ VIVAISTICHE

UNITÀ OPERATIVA / *OPERATIVE UNIT*

VIA TEBANO, 144
48018 FAENZA (RA)

È CONFORME A / *COMPLIES WITH*

UNI 10939:2001
SISTEMA DI RINTRACCIABILITA' NELLE FILIERE AGROALIMENTARI
(V.ALLEGATO)

IL PRESENTE CERTIFICATO È SOGGETTO AL RISPETTO DEL REGOLAMENTO PER LA CERTIFICAZIONE DI CONFORMITÀ DI PRODOTTO
THIS CERTIFICATE IS BOUND TO FULFILMENT OF THE REGULATIONS APPLYING TO PRODUCT CERTIFICATION

PRIMA EMISSIONE* / *FIRST ISSUE** 21/12/2005

EMISSIONE CORRENTE / *CURRENT ISSUE* 21/12/2005

CERTIQUALITY S.r.l.

SINCERT

CERTIQUALITY S.r.l. ISTITUTO DI CERTIFICAZIONE DELLA QUALITÀ
Via Gaetano Giardino 4 - 20123 Milano - tel. 02 80691.71 - fax 02 86465295 - certiquality@certiquality.it
www.certiquality.it

centro attivita' vivaistiche

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CERTIQUALITY
UNI 10939

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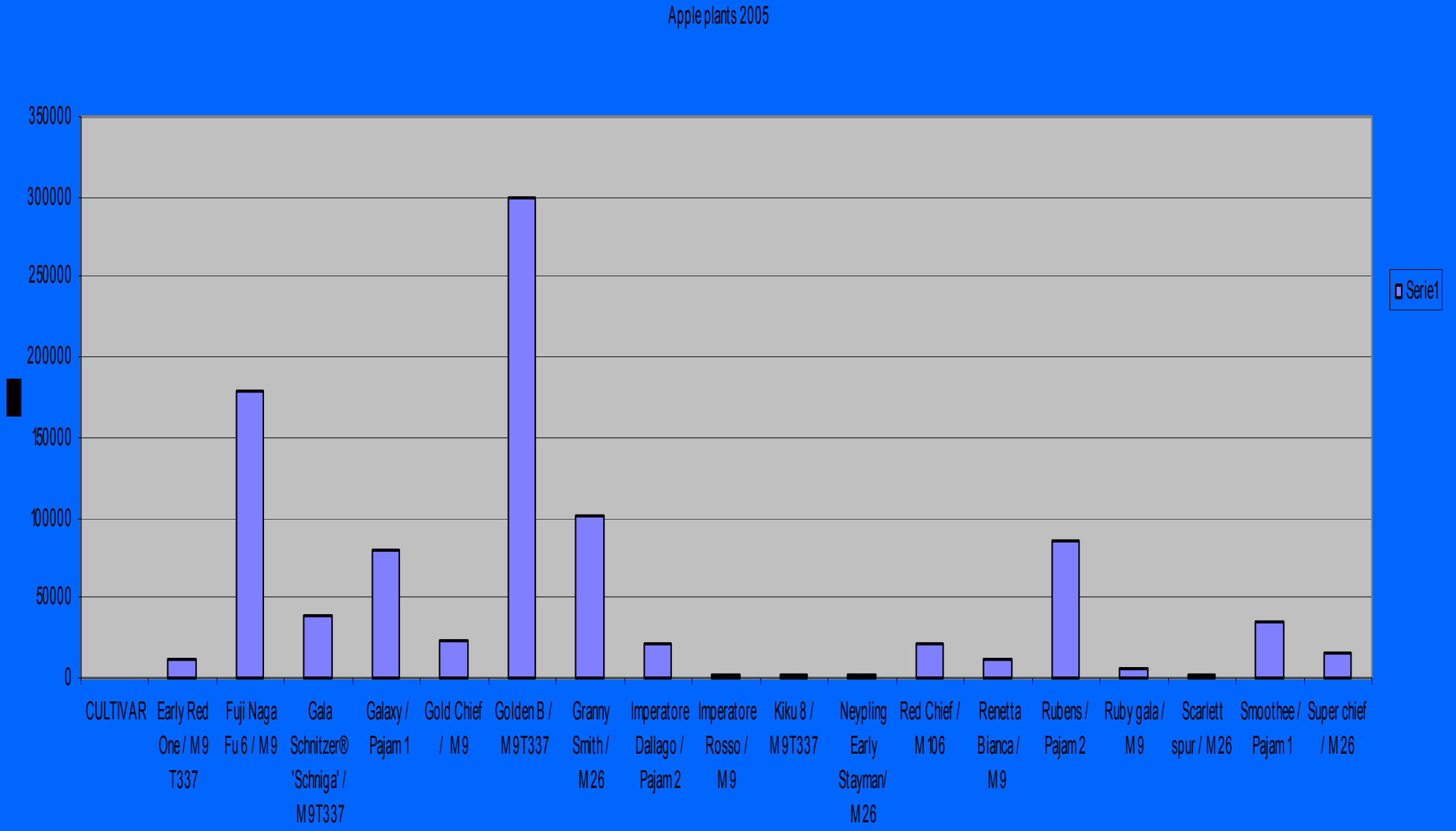
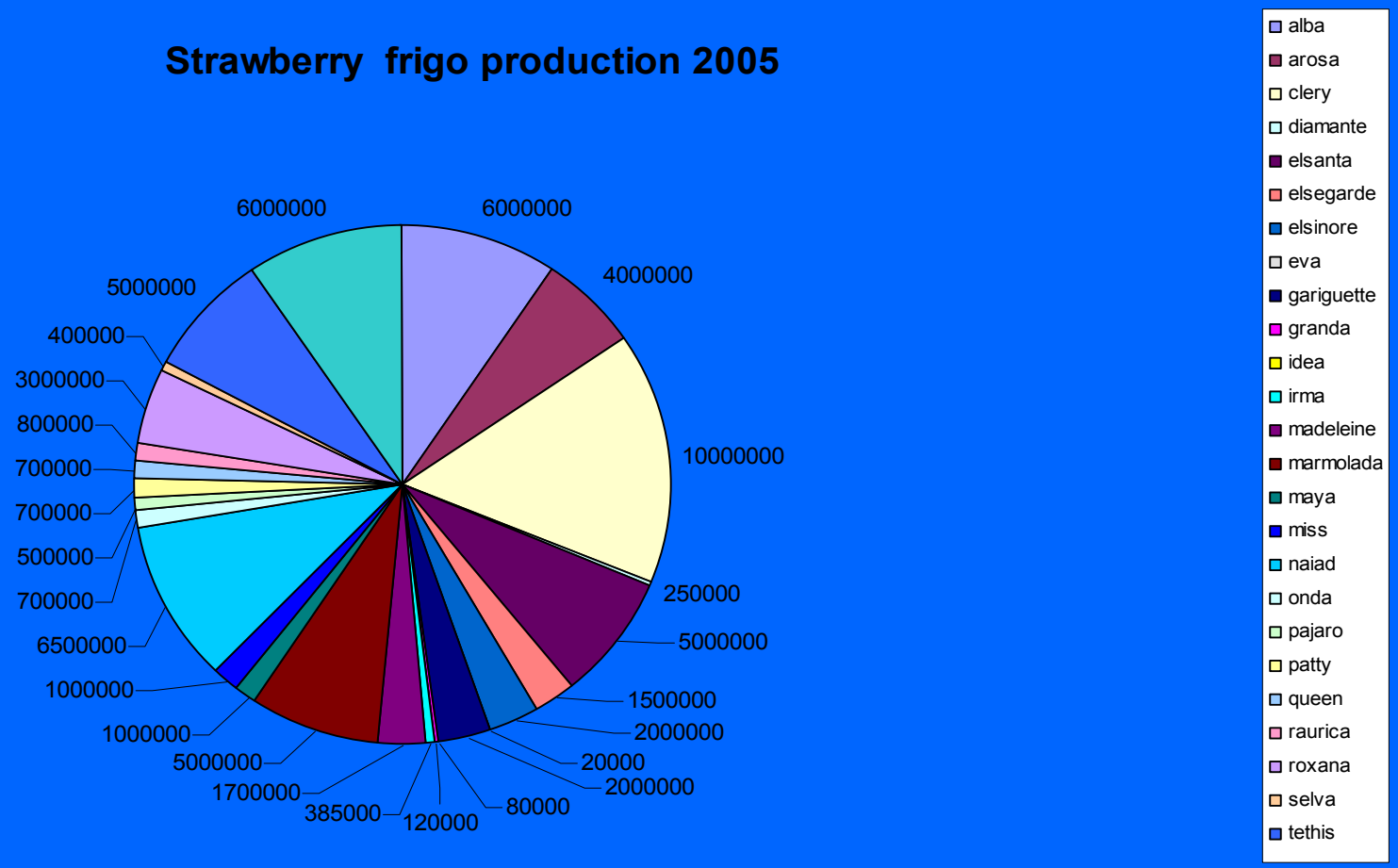
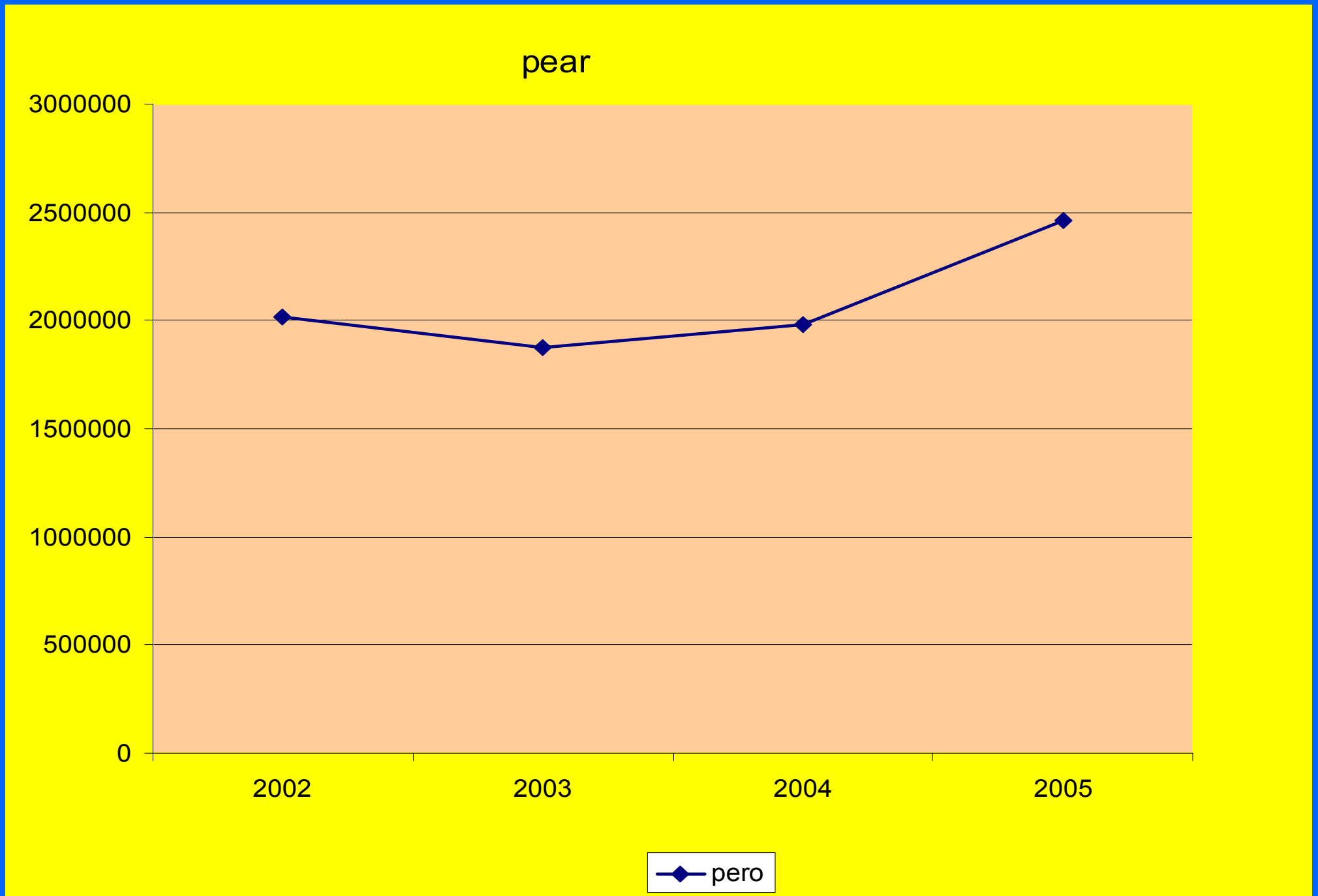
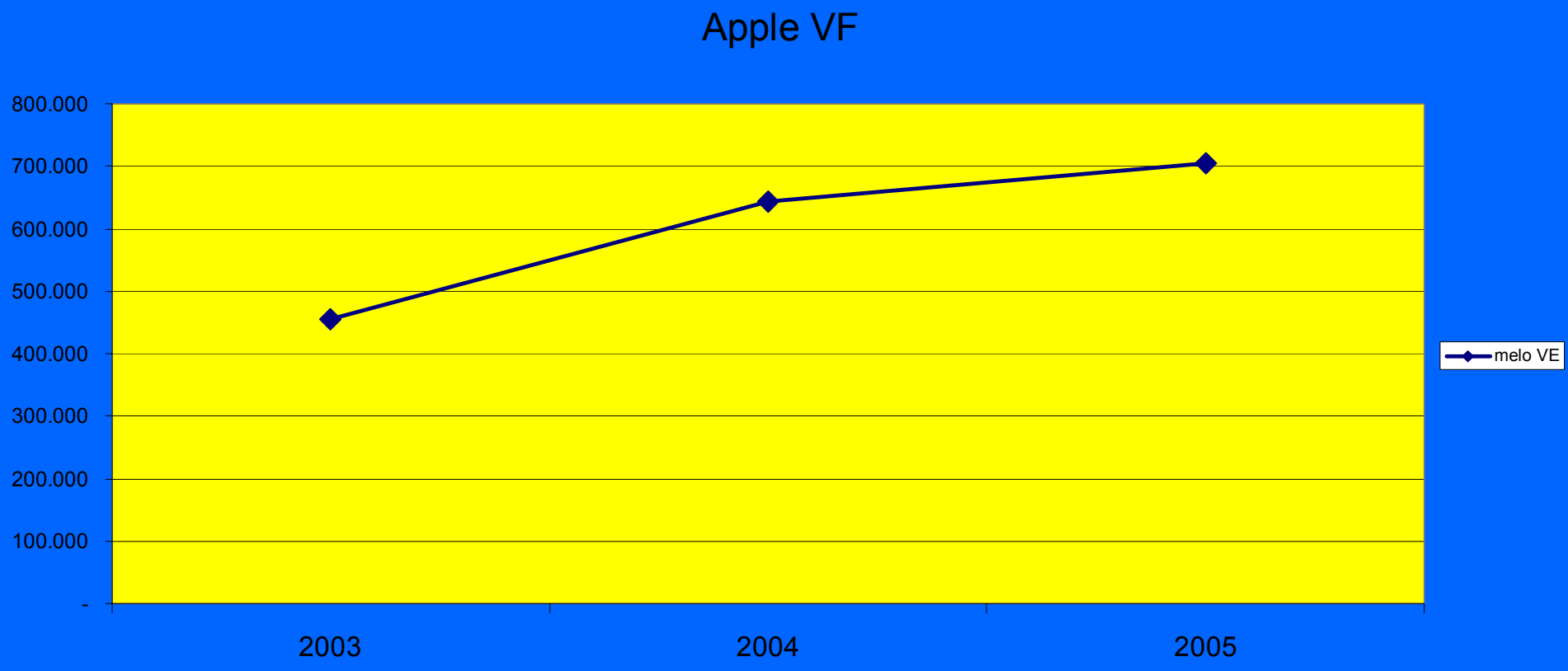
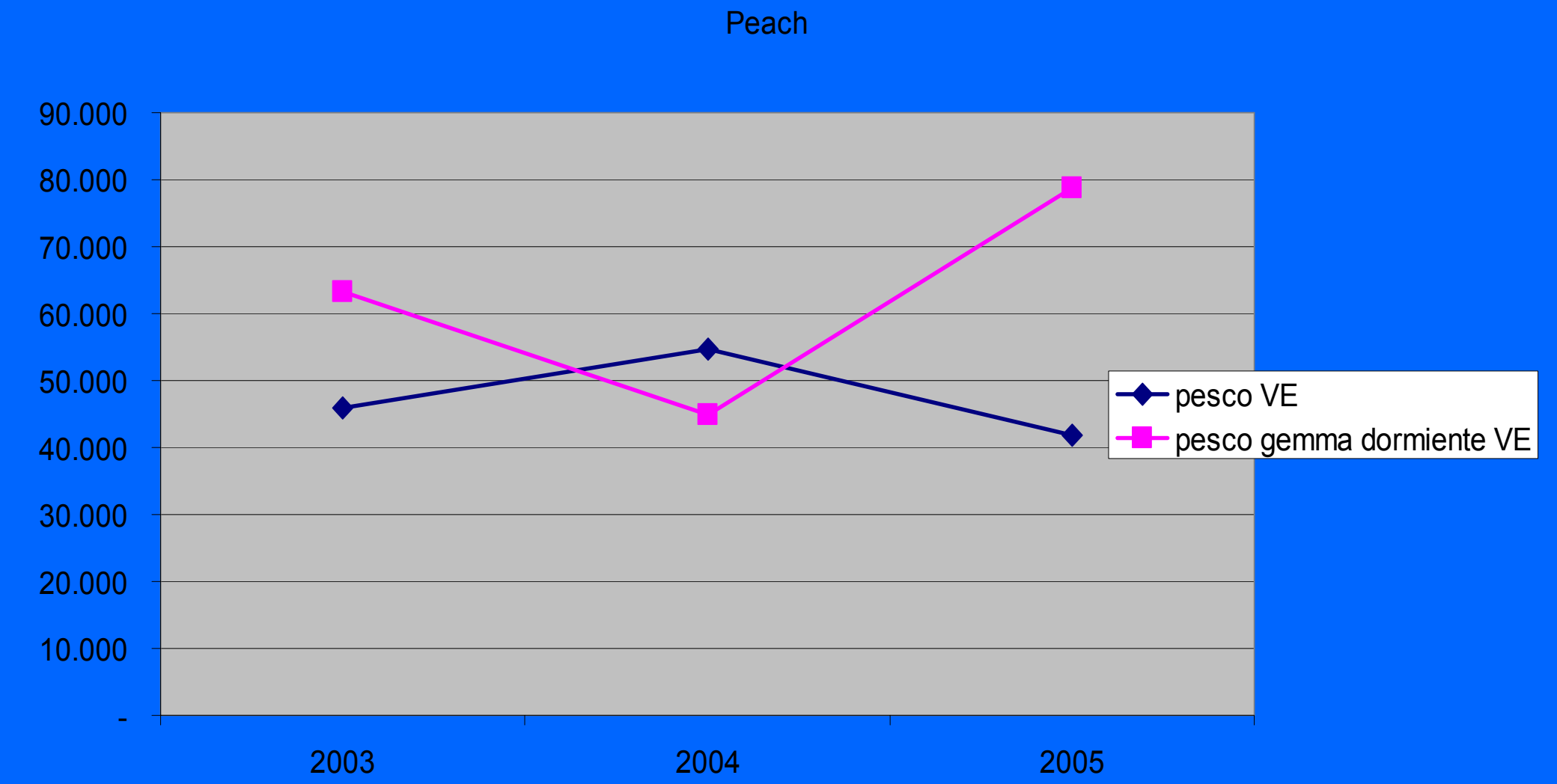

Apple plants 2005
350000
300000
250000
200000
150000
100000
50000
0
Serie1
CULTIVAR
Early Red One / M9 T337
Fuji Naga Fu 6 / M9
Gala Schnitzer® 'Schniga' / M9T337
Galaxy / Pajam 1
Gold Chief / M9
Golden B / M9T337
Granny Smith / M26
Imperatore Dallago / Pajam 2
Imperatore Rosso / M9
Kiku 8 / M9T337
Neypling Early Stayman/ M26
Red Chief / M106
Renetta Bianca / M9
Rubens / Pajam 2
Ruby gala / M9
Scarlett spur / M26
Smoothee / Pajam 1
Super chief / M26

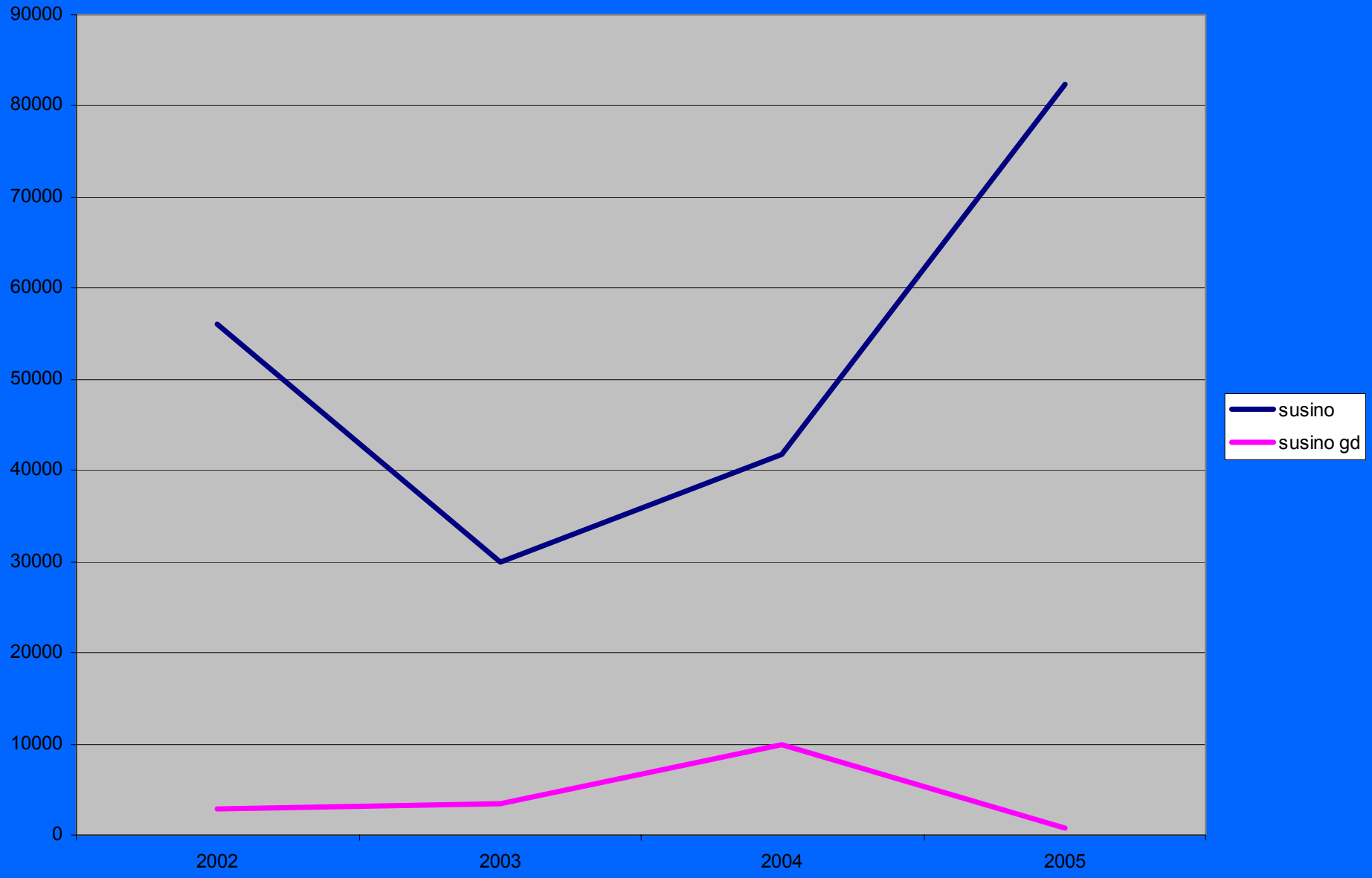

Strawberry frigo production 2005
6000000
6000000
4000000
10000000
250000
5000000
1500000
2000000
20000
2000000
80000
120000
385000
1700000
5000000
1000000
1000000
6500000
700000
500000
700000
700000
800000
3000000
400000
5000000
alba
arosa
clery
diamante
elsanta
elsegarde
elsinore
eva
gariguette
granda
idea
irma
madeleine
marmolada
maya
miss
naiad
onda
pajaro
patty
queen
raurica
roxana
selva
tethis


pear
3000000
2500000
2000000
1500000
1000000
500000
0
2002
2003
2004
2005
pero

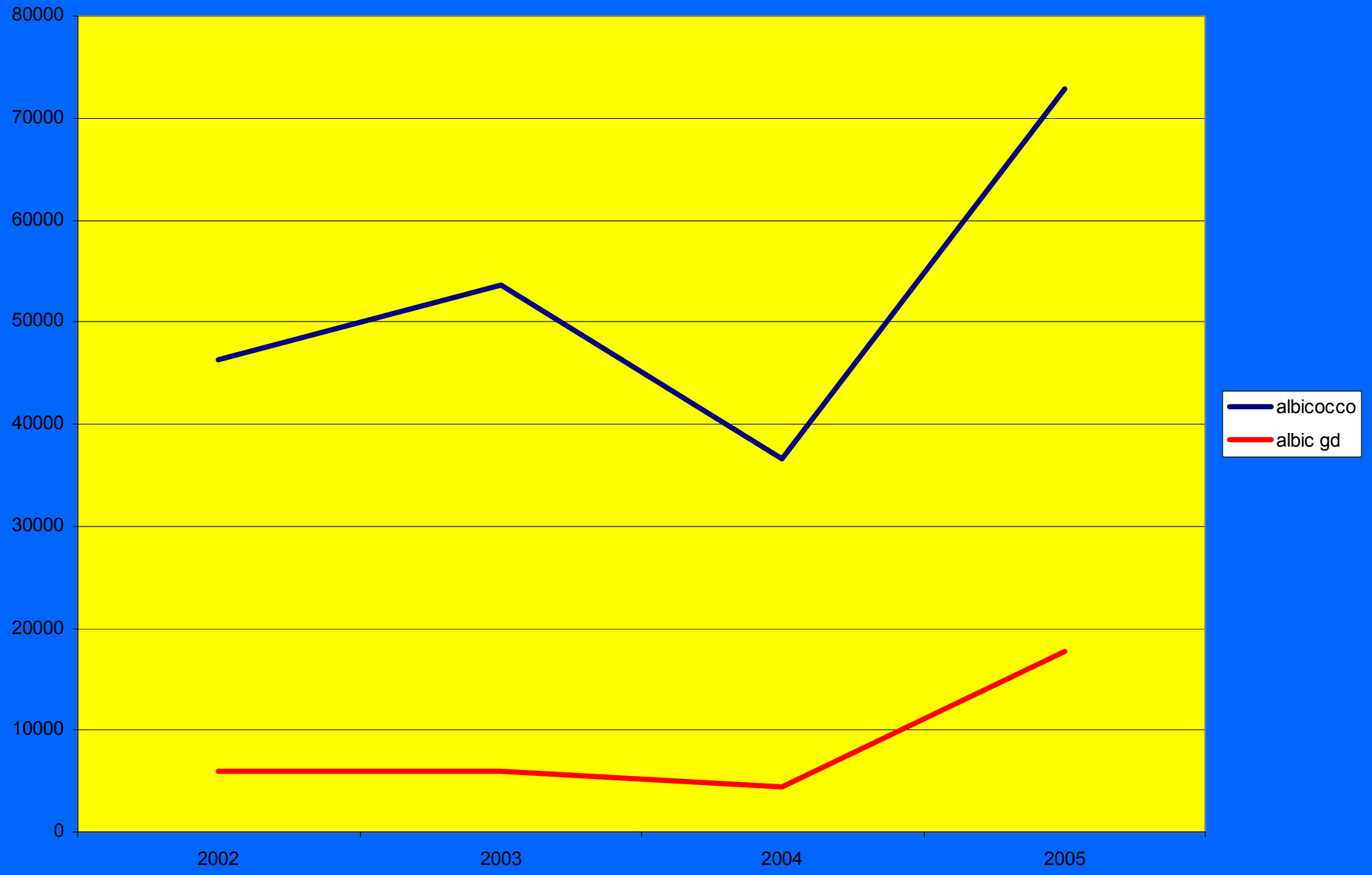

Apple VF
800.000
700.000
600.000
500.000
400.000
300.000
200.000
100.000
-
2003
2004
2005
melo VE

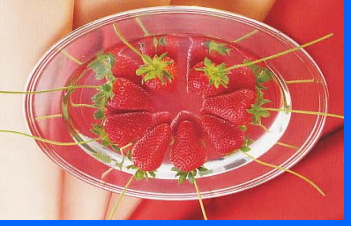

Peach
90.000
80.000
70.000
60.000
50.000
40.000
30.000
20.000
10.000
-
2003
2004
2005
pesco VE
pesco gemma dormiente VE

PLUMS

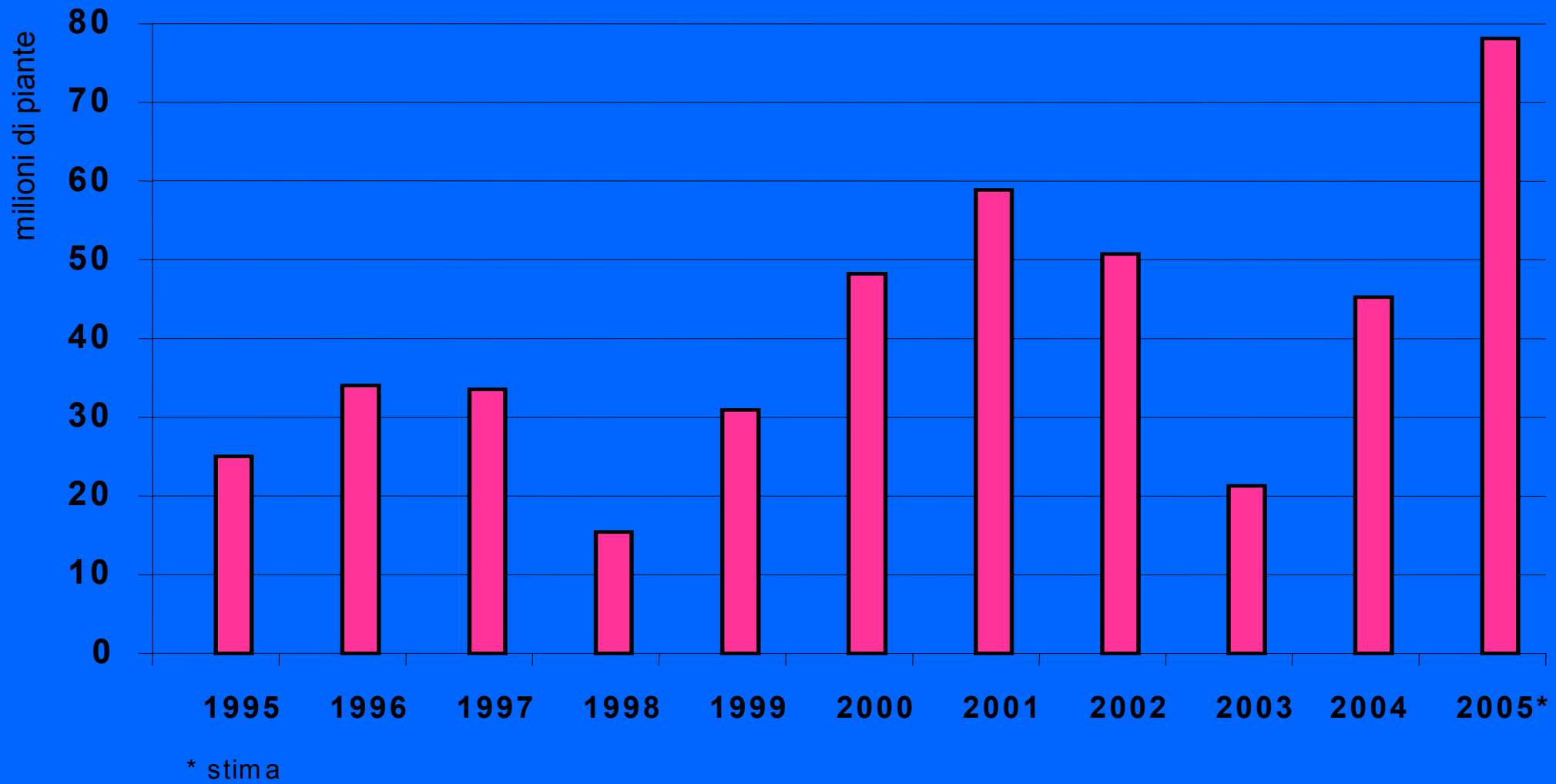

90000
80000
70000
60000
50000
40000
30000
20000
10000
0
2002
2003
2004
2005
susino
susino gd

APRICOTS

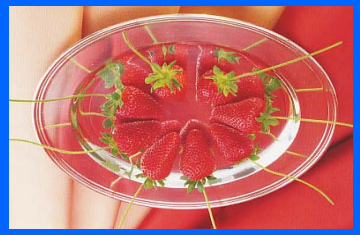

80000
70000
60000
50000
40000
30000
20000
10000
0
2002
2003
2004
2005
albicocco
albic gd



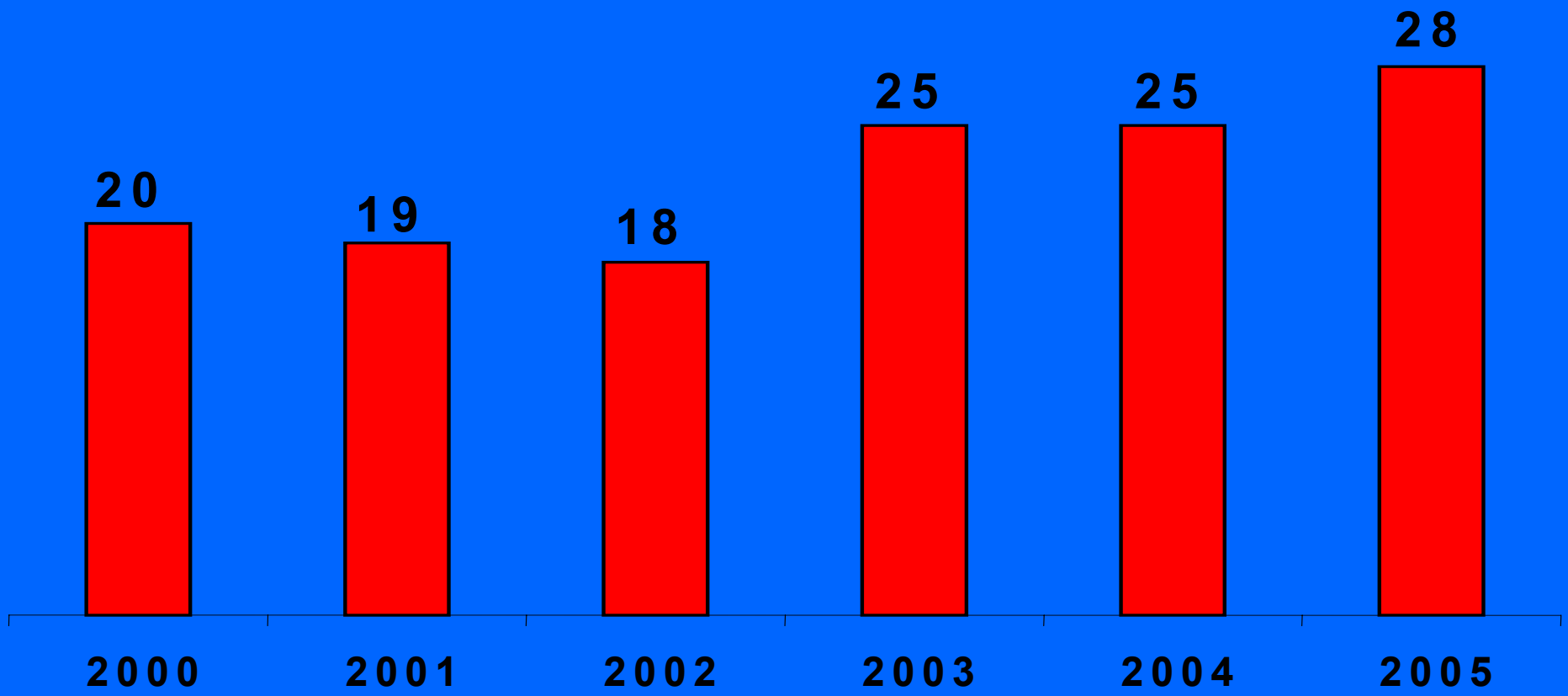
Piante certificate in Emilia Romagna

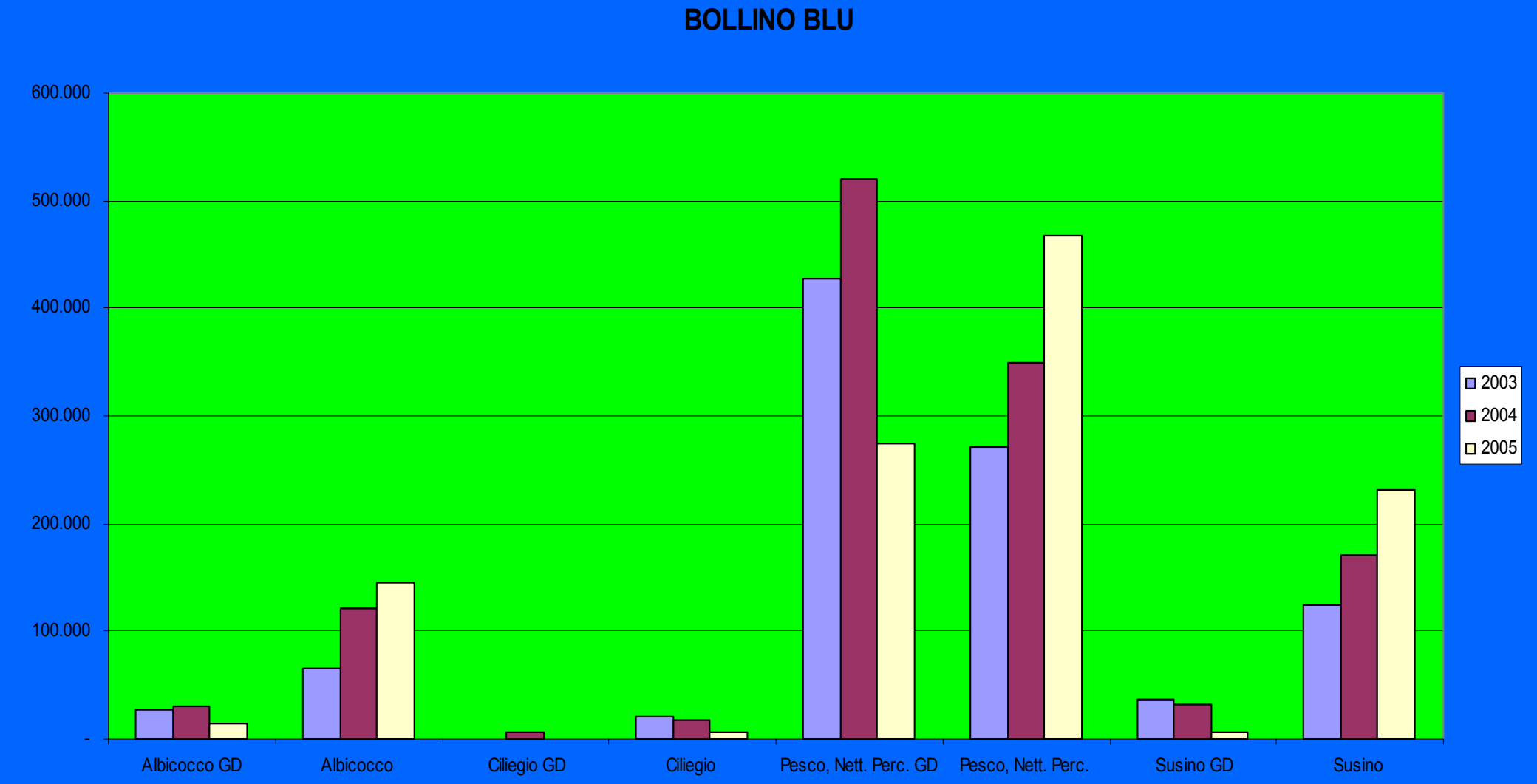


* stima



Varietà Certificate




BOLLINO BLU
600.000
500.000
400.000
300.000
200.000
100.000
-
Albicocco GD
Albicocco
Ciliegio GD
Ciliegio
Pesco, Nett. Perc. GD
Pesco, Nett. Perc.
Susino GD
Susino
2003
2004
2005

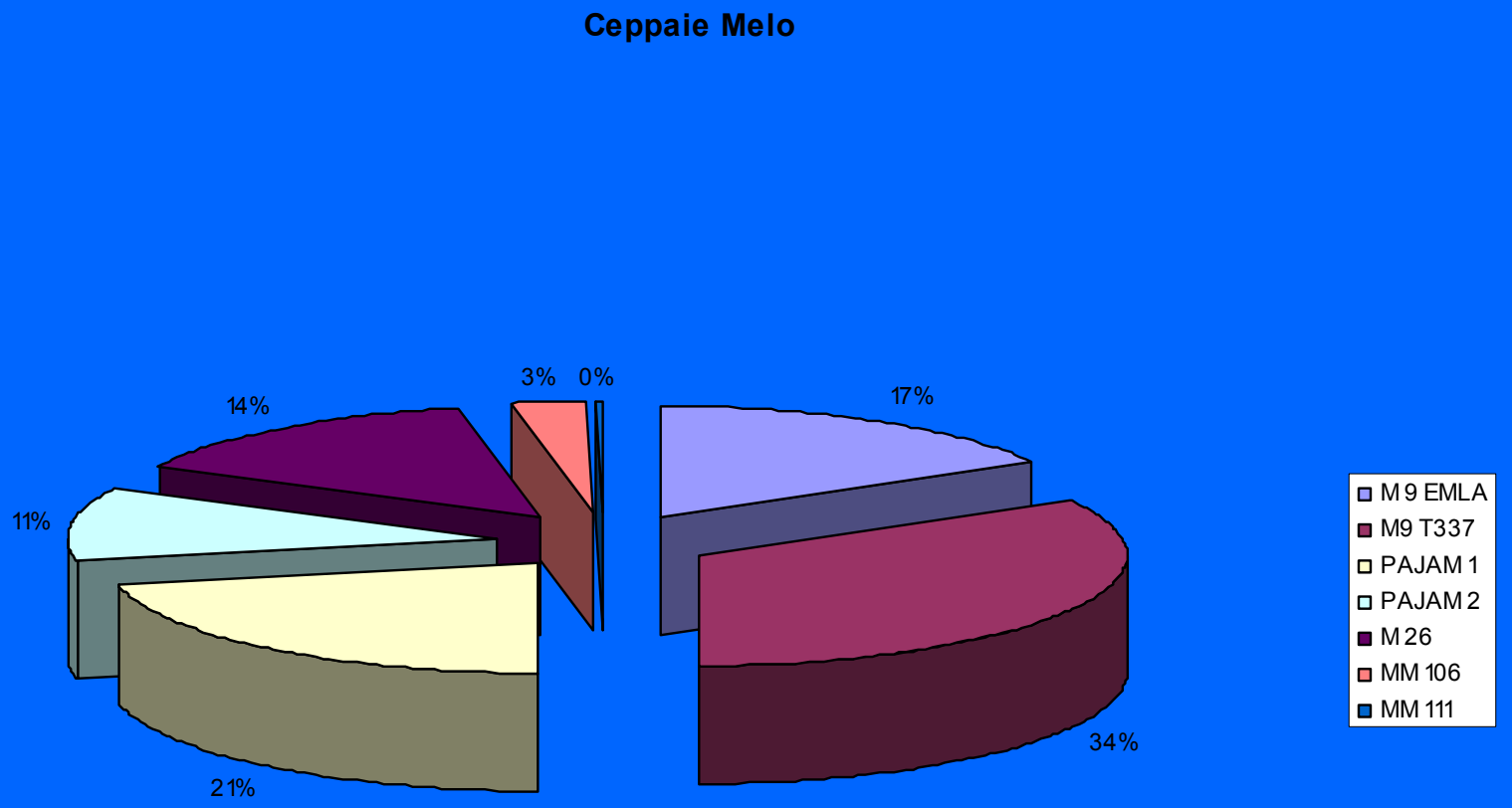
Rootstock Apple

Apple rootstock

	2005	2004	2003	2002	2001	2000
M 9 EMLA	*350.000*	367.350	393.000	137.000	220.000	592.000
M9 T337	*700.000*	544.400	988.000	1.035.000	740.000	297.600
PAJAM 1	*450.000*	489.000	270.000	430.000	610.000	359.750
PAJAM 2	*230.000*	230.000	230.000	340.000	300.000	275.750
M 26	*300.000*	285.000	218.000	179.000	183.000	209.900
MM 106	*60.000*	60.000	59.000	73.000	90.000	80.750
MM 111	*5.000*	4.000	5.000	5.000	4.000	8.200
TOT. MELO	*2.095.000*	1.979.750	2.163.000	2.199.000	2,1 mln	1,8 mln

Ceppaia Melo

Apple rootstock



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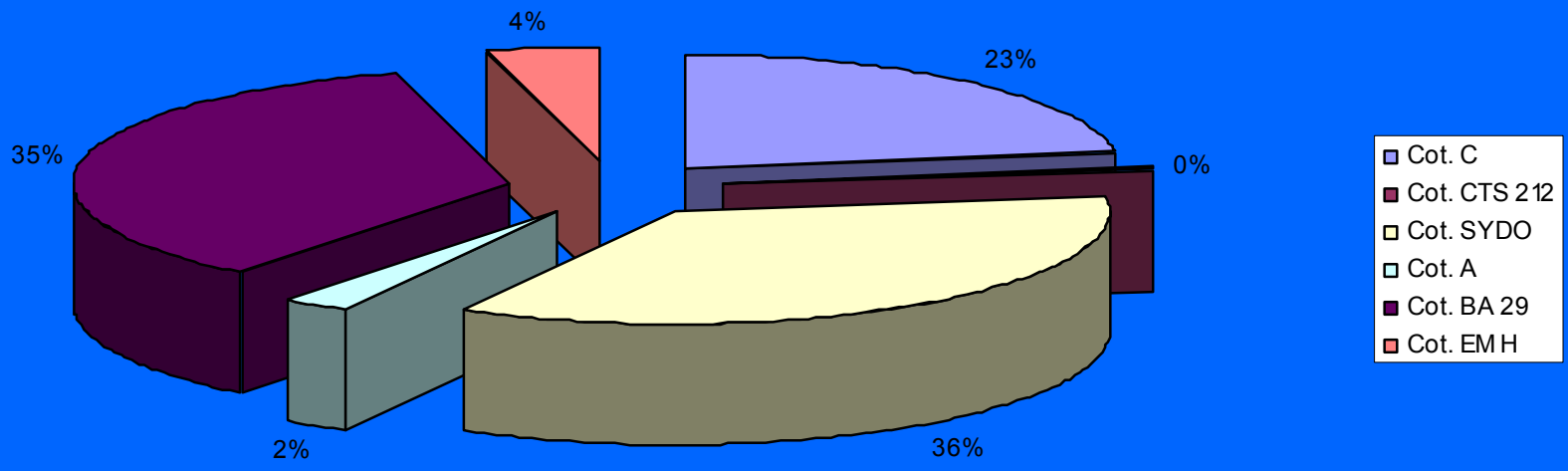
Portinnesti Pear

Pear Rootstock

	2005	2004	2003	2002	2001	2000
Cot. C	*650.000*	643.000	463.000	543.000	682.000	826.000
Cot. CTS 212	*5.000*	-	-	-	-	-
Cot. SYDO	*1.000.000*	920.000	870.000	690.000	760.000	662.370
Cot. A	*70.000*	68.000	66.000	76.000	82.000	148.000
Cot. BA 29	*1.000.000*	940.000	1.000.000	870.000	915.000	875.400
Cot. EM H	*120.000*	80.000	40.000			
TOT. PERO	*2.845.000*	2.651.000	2.439.000	2.179.000	2,4 mln	2,5 mln

Stoolbed

Pear rootstock



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Portinnesti drupacee

Peach rootstock

	2005	2004	2003	2002	2001	2000
MRS 2/5	*60.000*	66.000	21.000	41.500	77.000	33.000
29/C	*80.000*	40.000	15.000	80.000	50.000	-
TOT. DRUP.	*140.000*	106.000	36.000	121.500	127.000	33.000

Micropropagati

In vitro rootstock

	2005	2004	2003	2002	2001	2000
GF 677	*2.442.300*	1.831.440	2.194.140	2.651.100	2.486.520	2.262.120
GARNEM*	*137.640*					
BARRIER 1*	*40.080*	25.020	27.000	10.020	30.060	21.000
ISTHARA®	*118.320*	175.080	55.920	67.980	78.120	50.040
CADAMAN®	*385.080*	278.820	159.180	649.080	261.120	320.100
ADESOTO®	*84.600*	62.040	-	-	-	-
TORINEL®	-	-	-	-	11.880	-
TETRA*	-	-	-	6.000	18.960	-
PENTA*	-	-	-	10.020	14.040	
MRS 2/5	*20.400*	90.420	109.020	205.560	163.080	152.100
MIRABOLANO 29C	*736.140*	675.000	463.560	720.120	434.580	520.440

Stons micro

In vitro rootstock

Certificare perchè

- Certificazione = Prevenzione
- Certificazione = Informazione e sicurezza
- Certificazione = Protezione del reddito

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Certificazione = Prevenzione

- Prevenzione dai rischi genetici e fitosanitari.
- Questione SHARKA: Il sistema vivaistico e frutticolo Emiliano Romagnolo dimostrano che gli sforzi fatti non sono stati vani
- La certificazione e il programma Bollino Blu sono strumenti efficaci per la prevenzione da questa calamità
- Questa vicenda dimostra che “ il gioco di squadra” produce risultati (ricerca pubblica-viviaisti - servizi fitosanitari e O.P.)

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Certificazione = Informazione e sicurezza

- Chi produce alimenti ha l'obbligo di dare informazioni sulla origine. Deve dimostrare la tracciabilità
- La grande distribuzione richiede la conformità a standard internazionali quali BRC, IFS, EurepGap.
- La certificazione crea un ponte di informazioni tra il produttore e il consumatore
- Registrare e mantenere il flusso informativo non è una perdita di tempo.

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Certificazione = Protezione del Reddito

- Oggi il frutticoltore non può permettersi il rischio di investire con materiali vivaistici difettosi
- Utilizzare piante certificate significa piantare materiali ottenuti da un percorso ufficiale e tracciato.
- Chiarezza dei rapporti fornitore – cliente.
- Lotta alla contraffazione varietale

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La certificazione deve diventare lo standard produttivo

Quali sono gli ostacoli?

- Turn over varietale veloce (spec. Prunoidee)
- Regolamenti rigidi
- Costi certificazione (conservazione, moltiplicazione, analisi)
- Nonostante il rispetto delle procedure a volte insorgono incidenti di percorso e qui sorge il problema delle responsabilità

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I costi della certificazione

- I regolamenti devono tener conto delle realtà produttive. Le distanze dei vivai sono un fattore discriminante per la possibilità o meno di certificare. Maggiori distanze si traducono anche in maggior costi.
- La certificazione deve essere “ praparata” anche dai costitutori, una nuova varietà deve già possedere requisiti sanitari minimi.

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I ruoli nel processo

- I vivaisti non sono dei semplici “assemblatori” ma si assumono gran parte delle responsabilità
- Chi si prende le responsabilità deve essere ascoltato e riconosciuto anche nei momenti più politici e di “ amministrazione “ del sistema
- Il sistema del CAV dimostra che il vivaista può e deve essere il motore dello sviluppo.
- Le deleghe ad altri soggetti, che non rivestono ruoli concreti nel sistema, sono fuorvianti e comportano rischi in alcuni punti critici del processo.

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Conclusioni

- La certificazione deve tener conto della realtà, serve una visione concreta, se troppo teorica rischiamo di fare una “ macchina perfetta” senza mercato
- Dopo 20 anni dalla introduzione, chi ha CREDUTO E INVESTITO sulla certificazione ha avuto ragione
- I vivaisti professionali sono in diminuzione, chi resta nel mercato CERTIFICA.

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Conclusioni

- Un ringraziamento è doveroso verso quelle persone, aziende, Istituzioni ed Enti pubblici che si sono adoperate in questi 20 anni per “ far crescere” questa coscienza collettiva
- Se oggi la nostra frutticoltura riesce ad essere competitiva nonostante i problemi dei costi di produzione, dell’invecchiamento dei produttori, della stanchezza dei terreni e delle anomalie climatiche, un po’ di merito va dato al mondo vivaistico che con decisione ha saputo dare ai produttori giusti consigli e piante di elevata qualità

centro attivita` vivaistiche

Pomona Italiana – universal masterpiece by Giorgio Gallesio

Pomona Italiana de Giorgio Gallesio – capodoperă universală

Florin Stănică
Faculty of Horticulture
USAMV Bucureşti

Giorgio Gallesio
(1772-1839)

- Complex personality Count Giorgio Gallesio was farmer, lawyer, politician, diplomat, public officer, biologist.

-Count Giorgio Gallesio was born at Finalborgo in 1772 and spent his lifetime at the Gallesio-Piuma Castle in Prasco, near Genoa.

Gallesio-Piuma Castle

Giorgio Gallesio
(1772-1839)

-He spent 25 years (1814-1839) to travel in different states of Italian peninsula: Kingdom of Sardine, Kingdom of Lombardy, Kingdom of Two Sicilies, Church State, Grand Ducat of Tuscany, Ducat of Parma, Ducat of Modena, Austrian Empire.

Traveling, he searched for typical fruit species and varieties, making a detailed description, including measurements, colored pictures. He observed also the cultivation techniques in different regions.

Italy after Vienna Congress
1815

Pomona Italiana

Trattato degli Alberi Fruttiferi

Italian Pomology

- Giorgio Gallesio's capital work was published in Pisa between 1817-1839 under the edition of Niccolo' Capurro.

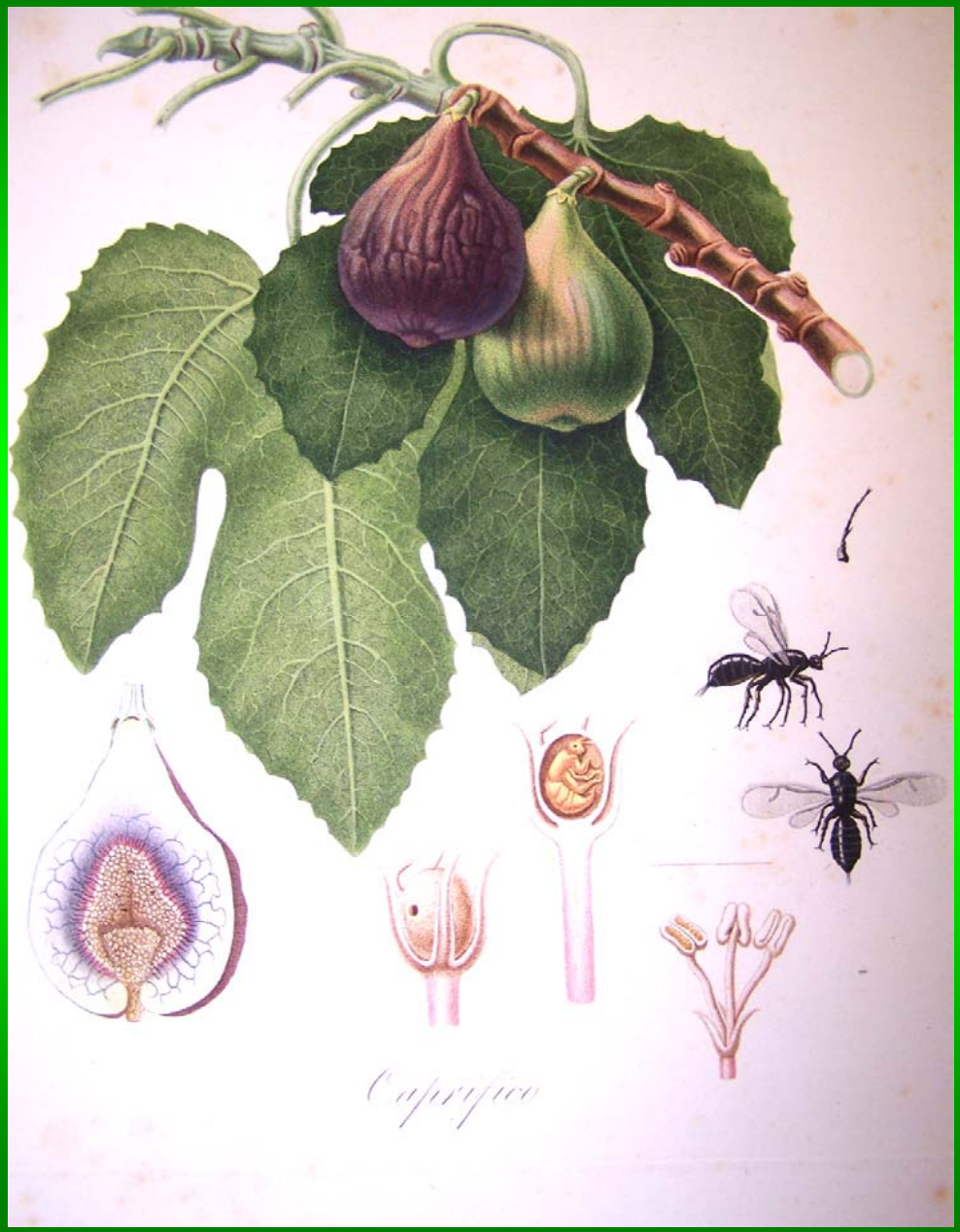
- It has 41 volumes (dispense) from 45 planned initially by the author.

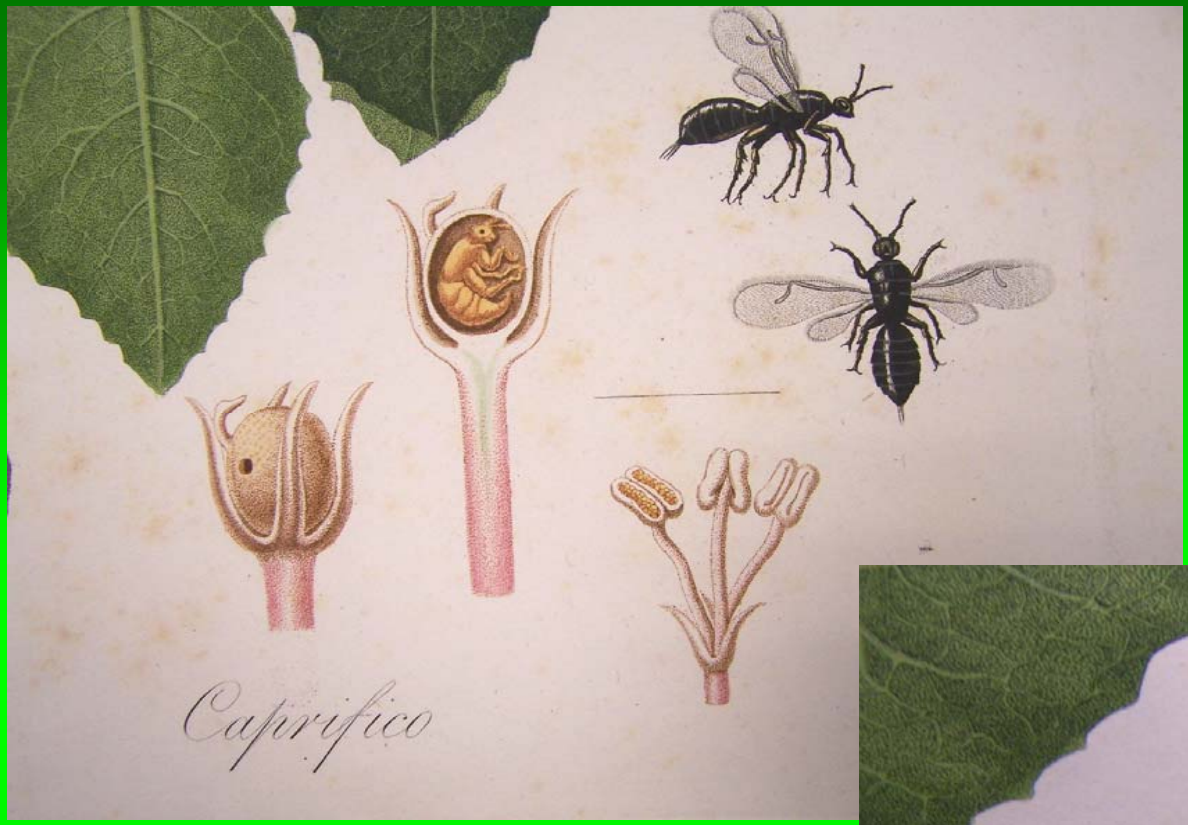
- Every volume has a number of 4 articles describing varieties from 15 fruit species

- The opera has 2 distinguish values:
  - Scientific
  - Artistic

Pomona Italiana – Scientific value

Common name	Latin name	No. of varieties
Almond	*Amygdalus communis*	2
Apple	*Malus domestica*	8
Apricot	*Armeniaca vulgaris*	5
Cherry	*Cerasus avium*	10
Chestnut	*Castanea sativa*	1
Carob	*Ceratonia siliqua*	1
Chinese date	*Ziziphus jujuba*	2
Fig	*Ficus carica*	21
Melogram	*Punica granatum*	1
Olive	*Olea europea*	1
Pear	*Pyrus communis*	22
Peach	*Persica vulgaris*	29
Plum	*Prunus domestica*	10
Pistachio	*Pistacia vera*	2
Hawthorn	*Crataegus monogyna*	1
Vine	*Vitis vinifera*	26





Blastophaga psenes

Fig fruit

Pesca Noce Spiccagnola gialla

A Buccia Paonazza

Disegnata dal vero da Domenico Del Prino in Genova

Incisa in Firenze da Luigi Giarrè

San Piero

Pomona Italiana
Trattato degli Alberi Fruttiferi

Special volumes:

- Trattato di Pomologia Generale (General Fruit Growing)
- Trattato del Fico (Fig tree) 1820
- Trattato del Lazzerolo (Hawthorn) – 1998, published by Prof. Enrico Baldini
- Trattato del Pesco (Peach tree) – 2003, published by Prof. Enrico Baldini
- Trattato del Ciliegio (Cherry tree) – 2003, published by Prof. Enrico Baldini

Pomona Italiana – Artistic value

-Designed by 13 painters and miniaturists including his daughter in law - Countess Pellina Piuma and the famous Domenico Del Pino

-Printed by a group of artists from that period

- For printing was used:
    - special engraving technique on copper sheets for the negative
    - special Fabriano paper
    - miniature hand finishing after printing
    - special pressing methods to obtain shining effect

Giorgio Gallesio's research activity

Gallesio organized variety trials in his "villa sperimentale" from Finale Ligure

He noticed synonymies and omonymies among the collected fruit varieties.

Pesca Carota

Giorgio Gallesio – Market studies

- An interesting work was the description of the city local markets in more than 36 cities that he visited during the time, from the big ones as Bologna, Firenze, Genova, Milano, Pisa and Torino, to small ones as Cesena, Ferrara, Ancona, Trieste, Venezia, Napoli, Pesaro, Asti, etc.

- Gallesio presented in his **"Giornali dei viaggi"** published in 1824, the situation and the evolution of the market, the fruit assortment in different seasons, the fruit size and price, etc.

- Interesting details regarding the fruit storage methods, fruit storability, fruit quality and fruit selling techniques are described.

- The author presented some information about fruit producers from different regions and their specialization.

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Risultati preliminari
dell'applicazione dell'A-MoF
su frutti di pesco
PESCO CAROTA
A. Pesca Carota *frutto magno ovatico, epicarpo rubro dense pubescente, sarcocarpo tenero, succo sanguineo, nucleo non adhaerente.* Fulgo Pesca Carota.
La Pesca Carota è la varietà la più singolare della specie Pesco.
La pianta nulla ha che la distingua dalle altre varietà, sia nelle foglie, sia nei fiori, ma il suo frutto ha un colore non diverso da quello delle altre Pesche, che basta l'attenzione anche dei più indifferenti.
La Pesca Carota è grossa, tondeggiante, ben turgida, e leggermente marcata da una parte dal solito solco, continuato dalla base alla cima.
La sua buccia, unitamente come in tutte le Pesche, è pervia senza colore proprio, è vellutata da una peluria densa e biancheggia, la quale uscendo il rosso sanguigno che riceve dal sugo, e la rende come grigia.
La polpa, naturalmente pastosa, non è senza delicatezza, ma ha un poco di acidulo, e non ne è sospesanta abbastanza dal sapore grato di, ma gentilmente delude. Il nocciolo, che è grosso, e di color rosso scuro, si stacca interamente dalla polpa.
Questa Pesca non è della più pregevoli per la bontà, e per la bellezza, non la sua singolarità consiste nel colore. Si è credato da alcuni che questo colore potesse essere carattere sufficiente per farne una specie distinta, giacchè pare che sia costante nella riproduzione. È facile però l'avvertire che in tutte le Pesche il sugo ha una tendenza al rosso, il qual colore è più o meno sviluppato
Pesco Carota
Pesca Carota

Lucrări ştiinţifice U.S.A.M.V.B., Seria B, Vol. L, 2007

VEGETABLE GROWING

THE STUDY IN COMPARATIVE CULTURE OF A PEPPER VARIETY RANGE CULTIVATED IN THE EAST AREA OF ROMANIA

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**USAMV BUCHAREST

Keywords: study, comparative culture, round pepper, *Capsicum annuum*

ABSTRACT

The researches were accomplished during 2004-2006 period of time, at Vegetable Research and Development Station BACĂU, aimed toward the study in comparative culture, in the pedo-climatic conditions from the east area of Romania, of an assortment of round pepper that included 26 varieties and local Romanian populations, in order to establish the best cultivars for this area.
In the present paper, we are presenting the results that were obtained for the first six best cultivars.

INTRODUCTION

Keeping in mind the fact that in the same pedoclimatic conditions and by applying the same technology if different varieties are cultivated us can obtain productions that are not the same from quantitative and qualitative point of view. The conclusion is that the element "biologic" – variety or hybrid – has an important role in the efficient utilization of the entire technological factors. For this reason, especially in the context of vegetable gardening sustainability, the element "biologic" has the largest mobility, being able to capitalize at highest level the conditions created through the optimization of the other factors (1).

MATERIAL AND METHODS

The experiments were developed at Vegetable Research and Development Station Bacau on a soil mudded, medium evaluated, with clay - sand texture, a pH of 6.2 – 6.8 and a humus contain of 2.4 – 2.6%.

For the best appreciation of the obtained productions the researches were made during a period of three years 2004-2006.

The experimental variant was formed from 54 plants (8.4 m^2), in four repetitions arranged in Latin rectangle. For the statistic analyze of the experimental dates the average of the three years was made, and the signification of the differences was established through test **t** Ceapoiu, 1978 (2).

RESULTS

The experimental results regarding the quantitative and qualitative characteristics obtained in our study are presented in table 1 and 2.

Table 1

The quantitative and qualitative characteristics of round pepper cultivars

Cultivar	Position of fruits/plant	The color of fruits at		Content in dry substance ^{0}R	Content in soluble glucids	Content in vitamin C mg/100 g
		Technologic maturity	Physiologic maturity			
Splendid	Erect and horizontal	Green	Red	5,4	3,24	200,75
Madalin	Intermediary	Green yellowish	Red carmine	5,5	3,25	200,73
Meteorit	Pendulum	Dark green	Dark red	5,5	3,25	200,74
Cornel	Pendulum	Green yellowish	Red	5,4	3,26	200,76
Lider	Erect	Green with yellow nuances	Red carmine	5,5	3,26	200,74
Creola	Pendulum	Dark green	Shining red	5,5	3,30	200,75

As we can see in table 1, the content in dry substances (expressed in ^{0}R) vary between 5,4 and 5,5, the content in soluble glucids between 3,24 and 3,30%, while the content in vitamin C had a small variation, all the analyzed cultivars presenting 200,73 and 200,76 mg/100 g.

Table 2

The quantitative characteristics of round pepper cultivars

Cultivar	Plant's height cm	Leaf's size cm	Fruit's dimensions				
			Length cm	Diameter cm	Index of form L/D	Weight g	Thickness mm
Splendid	38,6	8,5	4,5	7,5	0,6	70	8
Madalin	42,2	10,2	5,6	8,2	0,68	85	9
Meteorit	43,0	9,9	6,5	8,6	0,75	95	9
Cornel	42,3	9,5	6,2	8,2	0,75	88	10
Lider	40,1	8,6	4,8	7,6	0,63	75	8
Creola	45,5	11,5	7,5	9,4	0,79	102	12

Within the studied cultivar assortment the fruit's index of form vary between 0,6 and 0,79. The average weight of fruits had values between 70-102 g, feature correlated with the fruits thickness, that vary between 8-12 mm. These quantitative characteristic together with the accomplished commercial production were the selection criteria for the cultivars presented in the present paper.

Table 3

The characterization regarding the commercial production and physiological features of round pepper cultivars

Cultivar	Production t/ha^{-1}	Relative production % comparing with control (Splendid)	Average number of fruit physiologically matured / plant	Fruits I quality and extra % from total fruits	Precocity (no. days)		
					Blossom I harvest	Blossom 50% from harvest	Sprout I harvest
Splendid	26,7	100	6	65	62	74	125
Madalin	27,0	101,1	5	70	66	89	135
Meteorit	29,3	109,7	4	85	69	92	140
Cornel	31,7	118,7	6	90	58	82	130
Lider	33,2	124,3	7	85	56	72	119
Creola	38,7	144,9	6	98	55	71	120

The analyses of the dates presented in table 3 underline the fact that the number of fruits that reached to physiologic maturity until the first fall of autumn white frost vary between 4-7 fruits per plant. (In Romania the market demands are only for fruits that are physiologically matured, the green one can not be sold).

The precocity of the studied cultivars was 119 days for Lider variety, the earliest one and 140 days for Meteorit the latest one.

In what concern the quality of production the best results were obtained at Creola and Cornel cultivars. At these cultivars over 90% from the obtained production was I and extra quality.

Table 4

The syntheses of the production results obtained in the comparative study of a round pepper range

	Variant	Production t/ha	Difference comparing with the control t/ha	The signification of the differences
1.	Splendid	26,7	-	-
2.	Mădălin	27,0	+ 0,3	000
3.	Meteorit	29,3	+2,6	*
4.	Cornel	31,7	+5,0	***
5.	Lider	33,2	+6,5	***
6.	Creola	38,7	+12,0	***

DL 5% = 2,4 t/ha
DL 1% = 2,8 t/ha
DL 0,1% = 3,5 t/ha

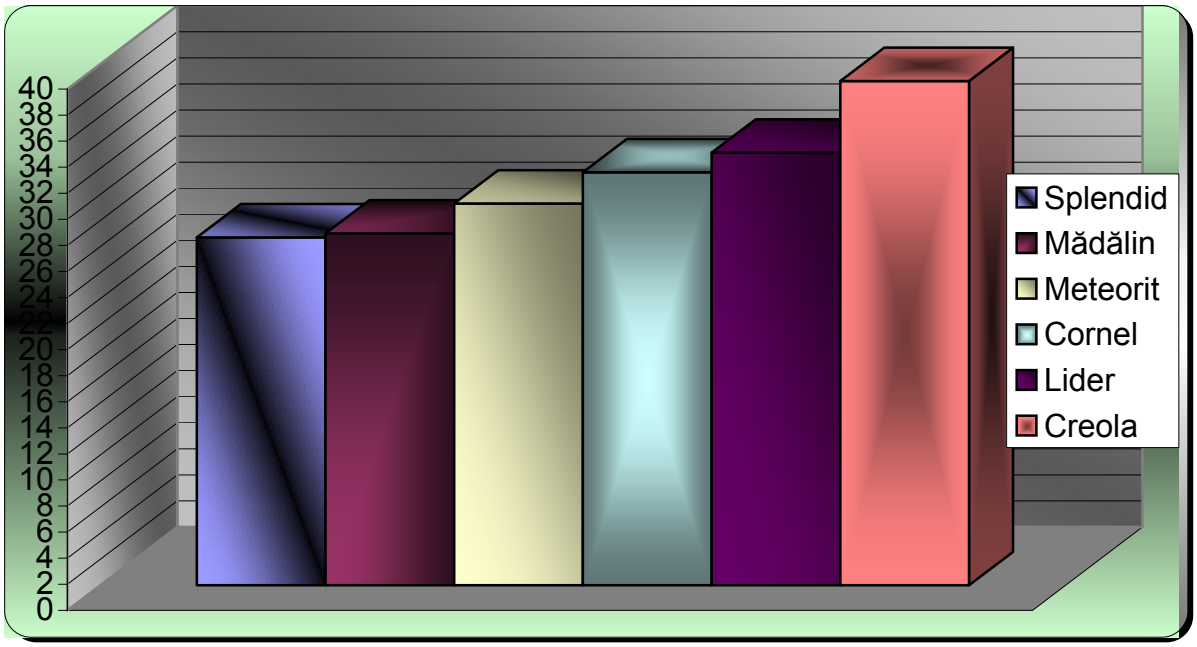

Fig. 1 - The syntheses of the results for the productions that were obtained in the comparative study of round pepper assortment

The experimental results presented in table 4 points out the commercial productions obtained in the comparative study of a round pepper range.

In the experimental conditions that occurred in 2004-2006 period of time (high temperatures associated with prolonged atmospheric drought), the productions obtained at round pepper had values between 26,7 and 38,7 t/ha.

The best results were obtained at the variants in which the varieties Lider and Creola were cultivated, these two varieties being also the most resistant to pest and diseases attack.

The statistic interpretation of the experimental data prove the fact that the best results were obtained at the variants in which were cultivated the varieties: Cornel (+5,0 t/ha^{-1}), Lider (+6,5 t/ha^{-1}) and Creola (+12,0 t/ha^{-}1).

CONCLUSIONS

1. In the east area of Romania for the cultivation of round pepper in open field we recommend to be cultivated only the early varieties at which more than 88% from the total production reach to physiological maturity until the first fall of white frost from autumn (October 1-10).
2. The earliest varieties are: Creola, Lider and Splendid.
3. The latest varieties were Meteorit and Madalin (35 %, respectively 32% from the total production didn't reach the physiologic maturity).

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Lucrări ştiinţifice U.S.A.M.V.B., Seria B, Vol. L, 2007

PRELIMINARY RESULTS CONCERNING THE GROWTH AND THE DEVELOPMENT OF THE CARDON CULTIVATED IN SOUTHERN ROMANIA

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Keywords: *Cynara cardunculus,* inflorescences, seeds

ABSTRACT

This work presents the results of our study concerning the different phenophases of cardon (*Cynara cardunculus*) cultivation in the conditions of southern Romania. The observations done were concerning the dynamic of growth and fructification and they had as aim the elaboration of recommendations for the technology of cultivation and also for extending the cardon's cultivation area. In the conditions of southern Romania the cardon plants have a vegetation period of more than 180 days, form shrubs of 100-170 cm height and a total number of inflorescences of 12-30. The seed yield can reach in average 264 g/plant from which 89.91 % is formed by the secondary inflorescences.

INTRODUCTION

The cardon (*Cynara cardunculus* L. - Familia *Compositae)* originates from the Mediterranean regions, where can be found in the spontaneous flora. It is known since antiquity when it was considered by Greeks and Romans a luxury vegetable. In our days it is known everywhere but it is mostly cultivated in Italy, France, Belgium and England. It is little known in Romania, being cultivated only by the amateur gardeners.

The cardon (wild artichoke) it is a prickly perennial vegetable resistant to drought as all the prickly plant species growing in the Mediterranean area. It is considered a winter plant because it uses the autumn and winter's rains. Its radicular system is deep and robust thus protecting from erosion the sloping fields and the unfertile ones. Even though originally is a perennial plant in Romania is considered an annual vegetable (Olimpius, 1994, Chaux Cl şi Foury Cl., - 1994).

From cardon it is used for human nutrition the leafstalk and the principal boot of the leaves (whitened) as well as the fleshy crown of the roots prepared mostly as salads. It is rich in mineral salts and vitamins available for the human body in the autumn-winter time, when they are so much needed (Ciofu et al 2003). The cardon is a plant with a nutritional, medicinal and economical remarkable value. The cardon's leaves are used as forage for the cattle's. It is also an energetically plant due to the oils obtained from its seeds (Olimpius, 1994).

FIELD EXPERIMETS, MATERIAL AND METHODS

In 2007 the cardon (*Cynara cardunculus*) was cultivated and it was followed the height of the plants in different vegetation phases as well as the formation and number of inflorescences and seeds.

The experiment was organised on a surface of 100 m^2 on the field of the Department of Vegetables of the USAMV Bucharest.

The biological material studied was cardon from Italian commercial seeds.

The agrotechnics applied respected the cultivation technology indicated by the literature of specialty, with some modifications given by the cold sensitivity of cardon plants.

The seedlings were produced in a warm greenhouse, by be studding in vegetation minihouses and pricked out in plastic pots with the side of 10cm. The field planting was done on 15 March 2007, at the distance between plants of 1/1 m. During vegetation period were applied weeding and wettings as necessary. The plants were treated against the *Phyllotreta spp.*

OBSERVATIONS AND DETERMINATIONS

During the vegetation period there were followed individually a number of 10 plants, in order to distinguish the variability resulted from the seed multiplication of the original material. In order to underline the resistance of cardon plants to drought, mentioned in the literature of specialty, the irrigation of plants was done differentiate, thus meanwhile the majority of the plants were wetted 8 times at a spell of 3-4 weeks, 2 plants were never wetted and one plant was wetted only in the last part of the vegetation period. There were done measurements concerning the plants height, inflorescences number, seeds weight, number of seeds/ principal and secondary inflorescences and also it was determined the seed yield per plant and inflorescence type.

RESULTS AND DISCUSSIONS

Results concerning the plants height growth are presented in table 1 and figure 1. It can be observed that after 3 months since planting (13.07.2007), the plants height varies between 67 and 150 cm, with an average off 110 cm. In this period the average growing rate of the cardon plants was 0.35 cm. The unwetted plants (experimental variant 1,9 and 10) resisted but had the lowest growing rates.

During next 2 months (08.09.2007) the average growing rate was 0.40 cm per day. It can be remarked that in a vegetation period of 6 months the plants grown in average with 66.5 cm having a daily rate of 0.37 cm.

Results concerning the development of cardon plants in the conditions of southern Romania are presented in table 2 and 3 and also in figures 2 and 3. The dynamic of inflorescence formation (table 2 , fig.2) underlines the next:

- The total number of inflorescences varied between 7 and 23 per plant, in average 15 inflorescences per plant, at 110 days from planting (04.07.2007). After 2 months (08.09.2007) in average 3,4 inflorescences per plant were formed.
- From the total of inflorescences the secondary ones represented in average 92.28% at the first determination and respectively 93.67% after 6 months since planting (08.09.2007).

Concerning the development of cardon plants it can be also remarked, like in the case of height growth, that unwetted plants (experimental variant 9 and 10) had a much lower number of inflorescences per plant comparing with the average (7-9) and the percent of secondary inflorescence was also lower (89-94%).

Table 3 and fig. 3 show the **results concerning the characteristic features of cardon's inflorescences and seeds** at the physiological maturity. The registered data show the differences between the principal and secondary inflorescences. The weight of dried principal inflorescences varied between 44 and 55 g (average 47.67g) and the one of dried secondary inflorescences between 32 and 39 (in average 35.75). The average weight of the seeds from the principal inflorescences was 24.3g representing 50.6% from the total weight of dried inflorescence meanwhile that for secondary inflorescences was only 13.84 g (38.3%).

Great differences can be seen in the case of seeds number per inflorescence which was 1.6 times higher for the seeds formed on the principal inflorescence (in average 477 seeds/inflorescence) compared with the ones formed on the secondary inflorescences(in average 299 seeds /inflorescence).

The characteristics of cardon's seeds are: the length of the seeds was between 0.61 and 0.9 cm, the width 0.29-0.49 cm and the colour in different nuances of grey and brown.

The results concerning the cardon seeds yield are presented in table 4 and figure 4. It can be observed that the seed yield per plant varied between 135 and 412 g with an average of 263. 6 g /plant. The lows yields were obtained in the case of unwetted plants (experimental variant 9 and 10). In the case of principal inflorescence there can be harvested 24.3 g seeds /plant in average representing 10.09 % from the total seed yield. Comparatively the seeds yield from the secondary inflorescences was of 239.3 g/plant representing a high percentage of the total (89.91%).

CONCLUSIONS

1. In the conditions of southern Romania the cardon finds the appropriate conditions for growing and development.
2. In the conditions of water deficiency the plants are developing but with a reduced rate of growing, a lower height and a lower inflorescences number.
3. In vegetation season of 6 months the cardon plants had a daily growing rate of 0.37 cm.
4. The average seeds weight from the principal inflorescences represented 50.6% from the total weight of the dried inflorescence and for the secondary inflorescences only 38.3%.
5. The number of seeds on the principal inflorescence was 1.6 times higher compared with the ones from the secondary inflorescences.
6. The seed yield on the principal inflorescence was in average of 24.3 g seeds/plant representing 10.09 % from the total yield meanwhile the seed yield on the secondary inflorescences was 239.3 g seeds / plant with a higher percentage from the total (89.91%).

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Table 1. Growth of cardon plants

Variant	Height (cm)		The growing rate (cm/day)	Height (cm)	The growing rate (cm/day)	The growing rate (cm/day)
	15.03.2007	13.07.2007	123 zile	08. 09.2007	58 zile	181 zile
1	57	67	0.08	115	0.827	0.320
2	85	98	0.106	119	0.363	0.188
3	60	129	0.56	150	0.362	0.497
4	77	130	0.430	149	0.328	0.398
5	68	150	0.667	167	0.293	0.547
6	78	109	0.250	120	0.190	0.232
7	57	108	0.414	130	0.379	0.403
8	60	120	0.487	145	0.431	0.469
9	57	107	0.406	135	0.482	0.431
10	65	79	0.113	99	0.345	0.188
AVERAGE	66.4	109.7	0.352	132.9	0.4	0.367

Table 2. Number of inflorescences per plant

Variant	04.07.2007		13.07.2007		08. 09.2007	
	Total no of inflorescences	Secondary inflorescences %	Total no of inflorescences	Secondary inflorescences %	Total no of inflorescences	Secondary inflorescences %
1	14	92.86	15	93.33	18	94.44
2	23	95.65	23	95.65	25	96
3	22	95.45	27	96.29	29	96.55
4	13	92.3	15	93.33	19	94.74
5	10	90	12	91.66	14	92.86
6	17	94.1	17	94.12	18	94.44
7	14	92.86	14	92.86	15	93.33
8	20	95	21	95.24	24	93.83
9	9	88.89	9	88.89	12	91.67
10	7	85.70	7	85.70	9	88.89
AVERAGE	14.9	92.28	16	92.70	18.3	93.67

Table 3. The weight of dry inflorescens, the weight and the number of seeds per inflorescence

Inflorescence type	Weight of dry inflorescence (g)	Weight of seeds /inflorescence		Number of seeds per inflorescence
		(g)	%	
Principal inflorescence				
1	44	20.246	46.01	418
2	46	21.304	46.31	451
3	46	22.945	49.8	467
4	47	23.698	50.42	472
5	55	33.404	60.73	557
6	48	24.202	50.42	495
Average	**47,667**	**24.3**	**50.61**	**476.66**
Secondary inflorescence				
1	32	10.503	32.82	249
2	36	12.284	34.12	276
3	36	12.973	36.04	286
4	39	19.586	50.22	386
Average	**35,75**	**13,836**	**38.3**	**299.25**

Tabelul 4. The assessment of seed yield on cardon plants

Experimental variant	Total seeds weight/plant (g)	From wich:			
		Principal inflorescence		Secondary inflorescence	
		g	%	g	%
1	259.512	20.246	7.800	239.266	92.20
2	356.364	21.304	5.980	335.06	94.02
3	411.708	33.404	8.110	378.304	91.89
4	273.348	24.196	8.850	249.152	91.15
5	204.168	23.698	11.607	180.47	88.39
6	258.605	24.500	9.473	234.105	90.53
7	218.004	22.945	10.298	195.059	89.70
8	342.528	24.202	7.066	318.326	92.93
9	176.496	24.500	13.880	151.996	86.12
10	134.988	24.104	17.860	110.884	82.14
Average	263.572	24.300	10.090	239.262	89.91

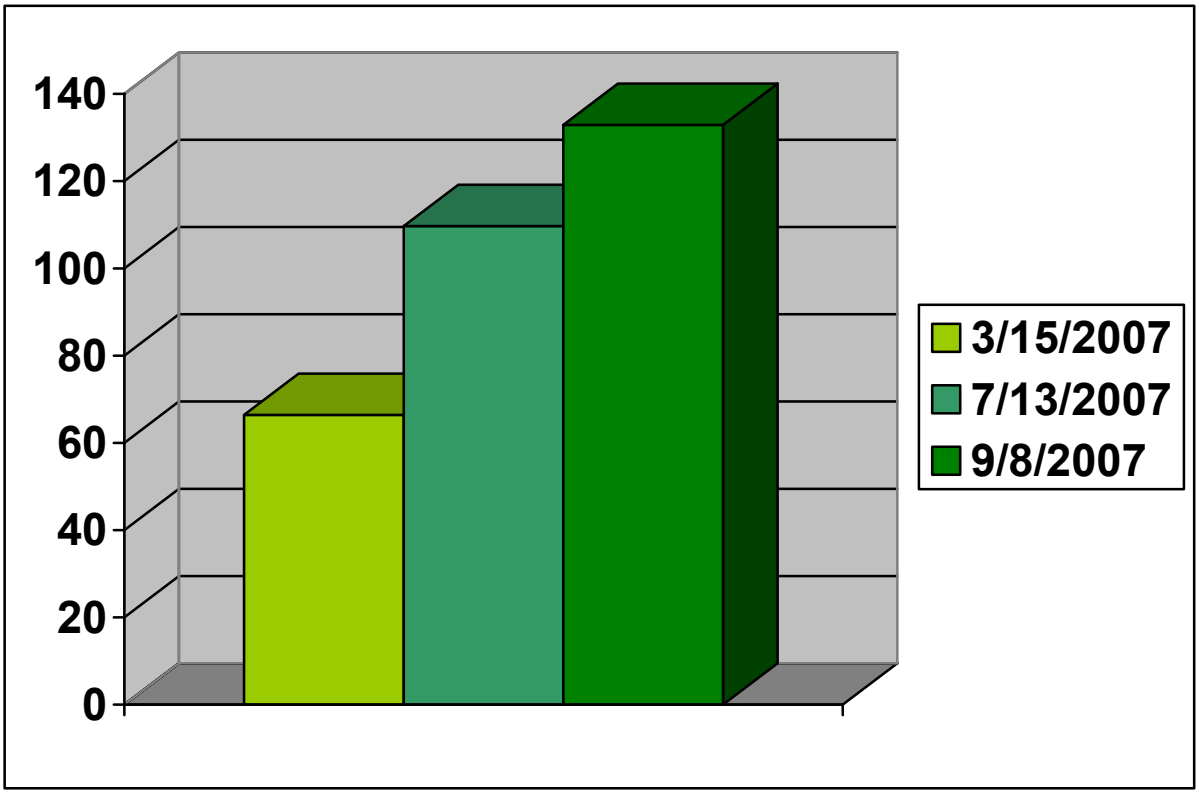

Fig. 1 The height of cardon plants during different phenophases

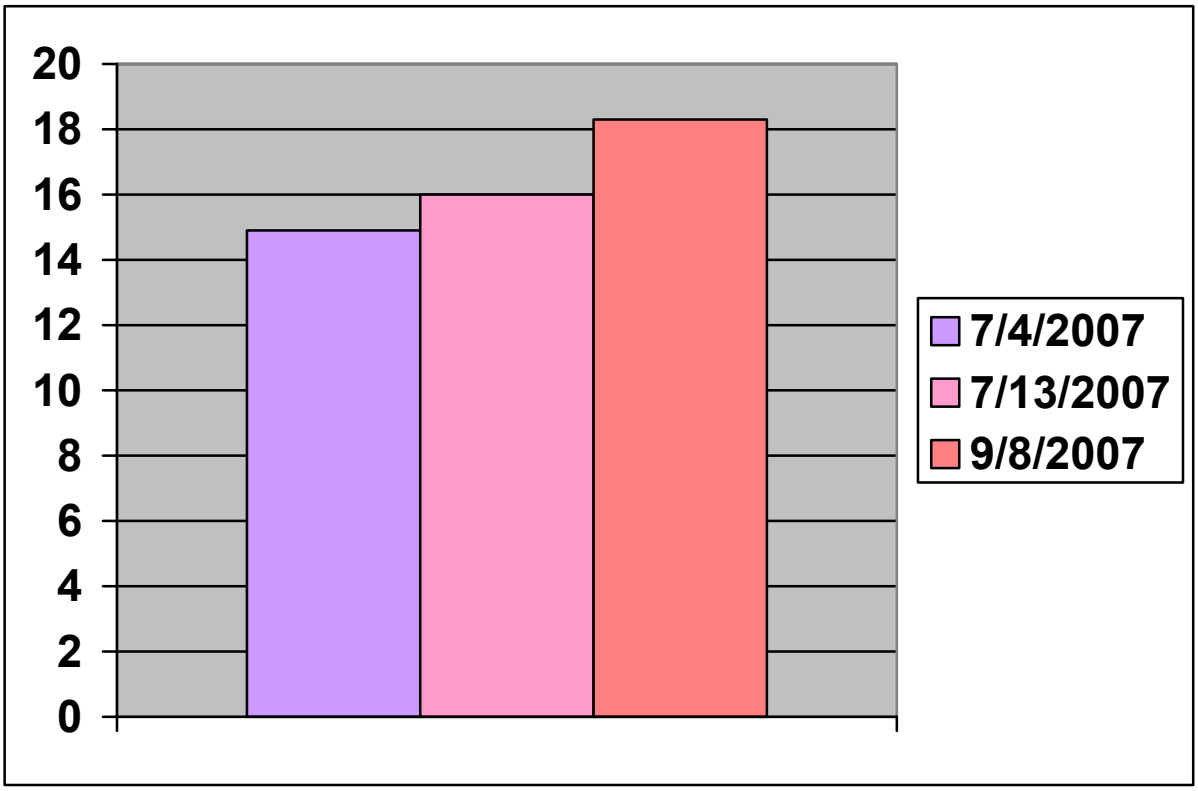

Fig. 2 Number of inflorescences during different phenophases

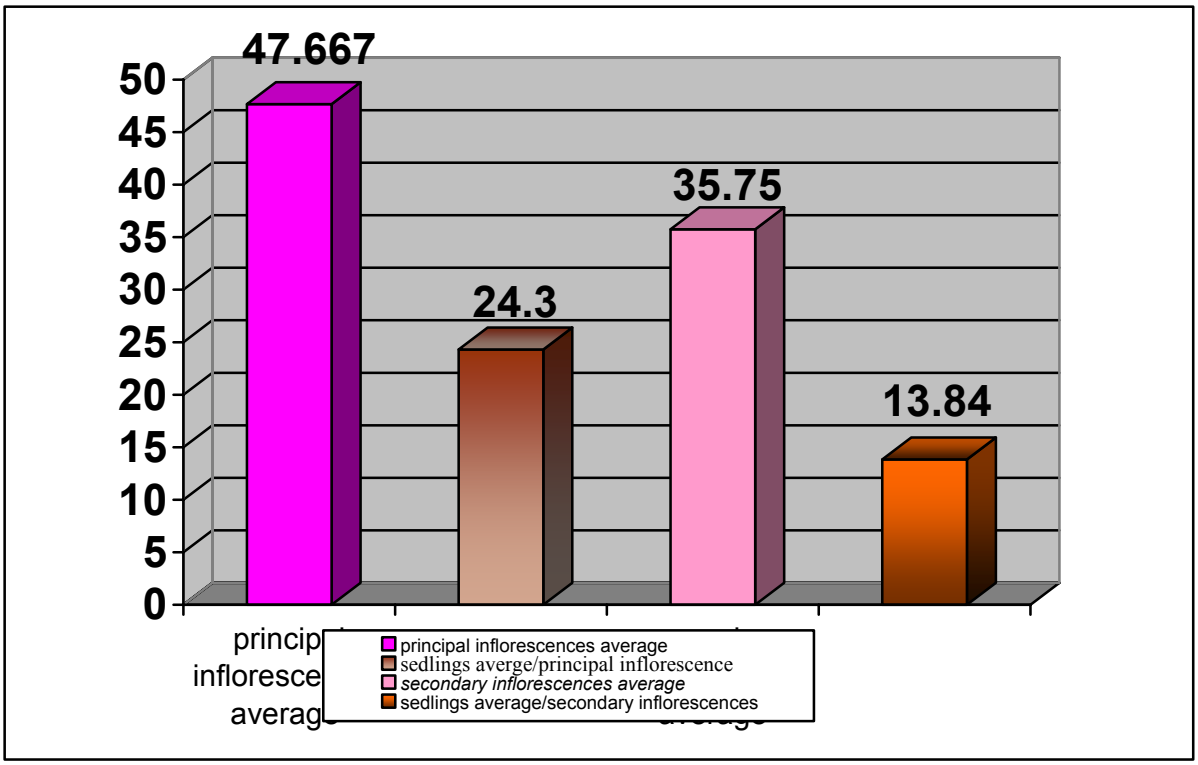

Fig. 3 The dried inflorescnces and seeds weight for the different inflorescence type

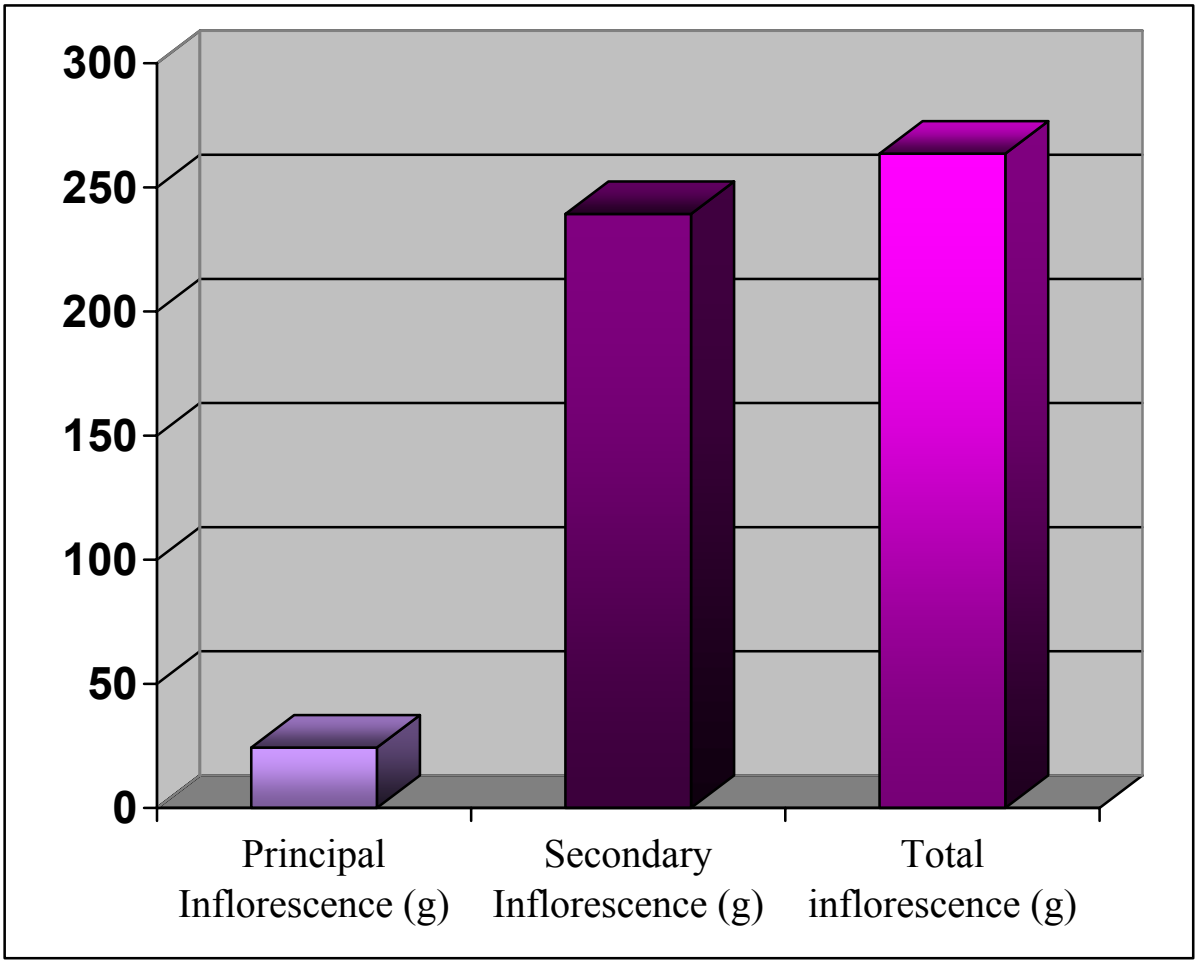

Fig. 4 The yield of cardon seeds

Fig. 5 Cardon plants in bloom

Fig. 6 Dried cardon inflorescence

Fig. 7 The harvest of cardon's seeds

Fig. 8 Inflorescences, seeds with papus and seeds harvested from the inflorescence

Fig. 9 Inflorescence's base after dried seeds harvesting

Fig. 10 Inflorescence's base, seeds with papus and harvested seeds

Fig. 11 Inflorescence in different phases of seed's harvesting

Fig. 12. Cardon seeds harvested from 4 inflorescences

Fig. 13 Weighing of seeds

Fig. 14. Weighted seeds prepared for storage

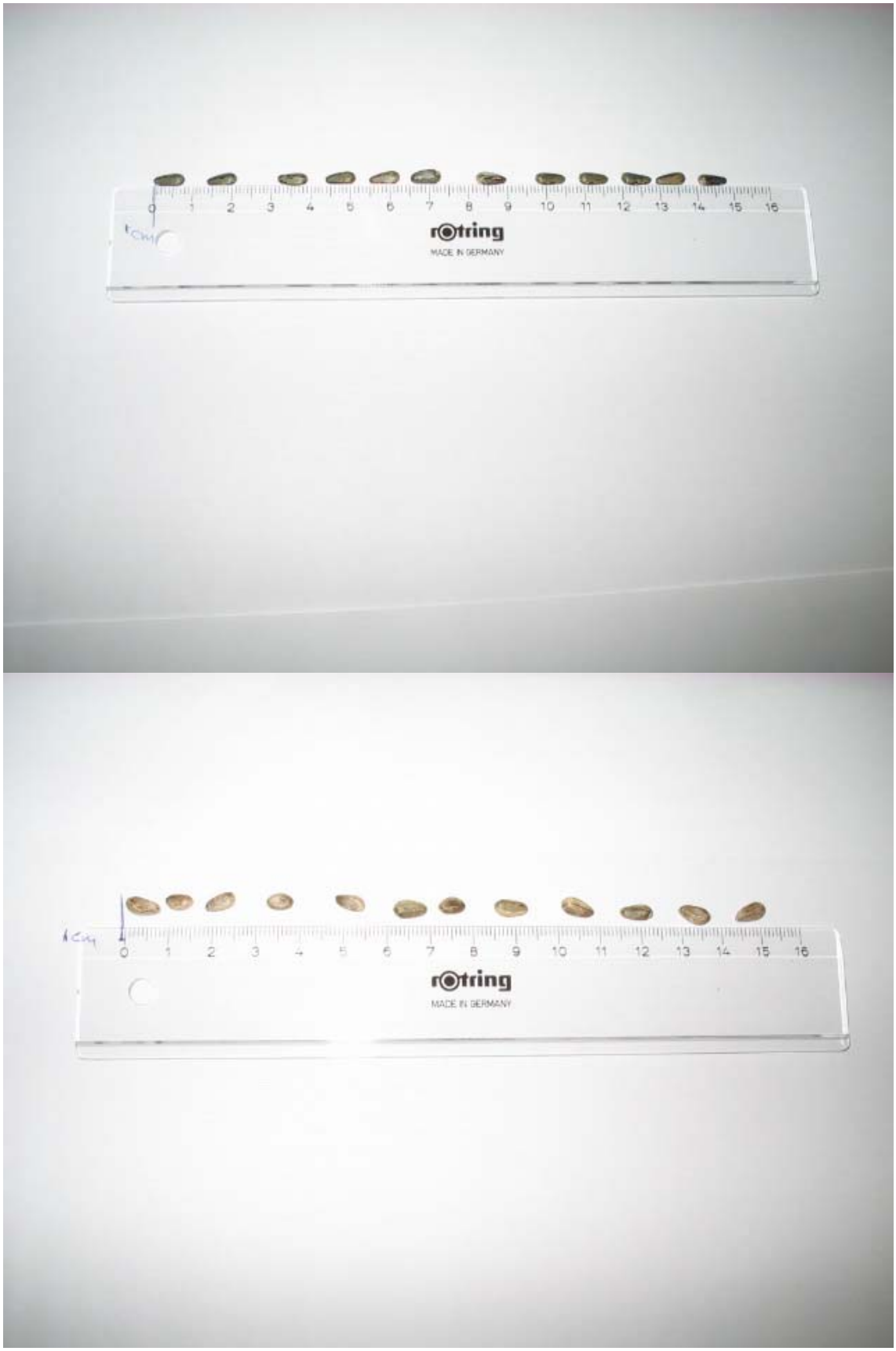

Fig. 15 Cardon's seeds

Lucrări ştiinţifice U.S.A.M.V.B., Seria B, Vol. L, 2007

"CAPRICIU", A NEW VARIETY OF CHERRY TYPE TOMATO *LYCOPERSICON ESCULENTUM MILL. VAR. CERASIFORME* ALEF.

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SHORT HISTORY OF CHERRY TYPE TOMATOES

Tomatoes are the most cultivated vegetables in the whole world. As pepper, potato and eggplants, tomatoes belong to the Solanaceae Family.

The common German name of tomato is "the wolf's peach". In the XVIIIth century Carl Linnaeus defined this variety after the legend naming the species *Lycopersicon esculentum*, that means „the wolf's edible peach".

The strongest proofs regarding tomato's cultivation are of a cultural type. Linguistic evidence certifies that the Aztecs from Central America called the fruit "xitomatl", and the tribes of savages from Central America called it:"tomati". Then, there is genetic evidence. *Humboldt* (1811), *Philips* (1891), *Jenkins* (1948) considered that the original variety for the cultivated tomatoes is *Lycopersicon esculentum*, var. *cerasiforme*, initially found in Peru or Ecuador, then reaching Mexico where it was first used as a medicinal plant. The first plants brought from South America to Spain and Portugal, had yellow fruit, (this is the reason they named the tomatoes "pomodoro" in Italy). From Spain the tomatoes were first introduced to Great Britain (the end of the XVIth century), then to France were they were initially treated as ornamental plants (Vilmorin catalog, 1860) and only starting from 1878 they treated them as vegetables. In Germany, Switzerland and northern countries they were cultivated later, after the year 1870.

L. esculentum cerasiforme is considered to be the direct ancestor of nowadays cultivated tomato. In European Literature, tomatoes were first mentioned in the Herbarium written by Matthilos in 1544. The first cookery book which mentioned the tomatoes was published in Naples in 1692. Tomatoes were commercialized on the European market starting approximately with the year 1800.

Cherry type tomatoes are considered more related to the wild type from the point of view of disease resistance and yield capacity, the benefit of these advantages being higher than in the case of other types of cultivated tomatoes. In the case of cultivated varieties the inflorescence is less ramified and tends to be shorter.

In Western countries the tomatoes yield production increased from 1920 beginning with the *canning event.* Tomato canning was documentary attested for the first time in 1847 by Harrison Crosby, Lafayette College, Easton, Pennsylvania. Automatic peeling machines were made around 1890 and the mechanical extraction of the juice was invented in 1920, allowing orientation towards high level of dry substance tomato crops, for obtaining tomato paste. Cherry type tomatoes ripen homogenously, in a concentered manner, in naturally formed clusters, and can be harvested for industrialization (as juice canned tomatoes).

Cherry type tomato fruits have big lycopen content, the major carotenoid in tomatoes, responsible for the dark red color. The lycopen was credited as an antioxidant, annihilating the cells responsible for breast and prostate cancer, as many specialized studies proved it. Therefor the people who eat high quantities of tomato made products have a lower risk to develop cancer.

The first five tomato producing countries are: USA, China, Turkey, Italy and India.

The tomato occupies the 16th position among the fruit with rich vitamin A content, the 13th position for vitamin C, and regarding consumption, the tomato is the best provider for these two vitamins in the nations' diet.

The tomato also contains big quantities of lycopen, beta-carotene, magnesium, niacin, iron, phosphorus, potassium, riboflavin, natrium and thiamine, being the most important fruit or vegetable in the diet, and the main vitamin and mineral source in the world.

Taking into account the special qualities of this kind of tomato, we deemed it proper to introduce this variety for cultivation, as support for a still deficient diet in the field of health useful principles (vitamins, minerals), for assuring and maintaining people's health, as for diversifying the assortment of products with low degree of pollution on the market, as a result of their natural resistance to the main diseases and pathogen attack and on the basis of an integrated pest management of pathogens, with a reduced number of treatments, and using products with low level of toxicity or even biological products.

LINE 2 – TOMATO CHERRY TYPE VARIETY "CAPRICIU"

Cherry type tomato line registered for testing and homologation at State Institute for Variety Testing and Registration (I.S.T.I.S.) Bucharest in 2004-2005.

Homologated in 2007 as "Capriciu" variety, adequate for indoor, protected cultivation (greenhouse, plastic tunnels) as for open field cultivation.

DESCRIPTION

Early variety. Non-determined growth plant type, weak anthocyan pigment in the inferior 1/3rd of the stalk, pendent leaves, weakly blistered, 2 leaves between clusters, average length of internodes 4-5 cm, mainly monopodial clusters. Suitable for fresh consumption and industrializing.

Yielding production - 65-85 t/ha

Green collar fruit in the immature state and deep red, homogenous, glitter at technological stage.

Firm, sweet, flavored fruit.

Fruit average weight= 21.5-26.5 g;
Shape index =1.07;
Dry soluble substance weight = 7,0 ;
Two seminal spaces in cross section.

GARDENER'S DELIGHT – Witness variety

Early variety of cherry type tomato, indeterminate type, high, vigorous plants, rich foliage, medium green, semi erect leaves, fruit about 15 g, no green shoulder, light red, shinny at consumption state, pleasant taste.

INDUSTRIALIZATION

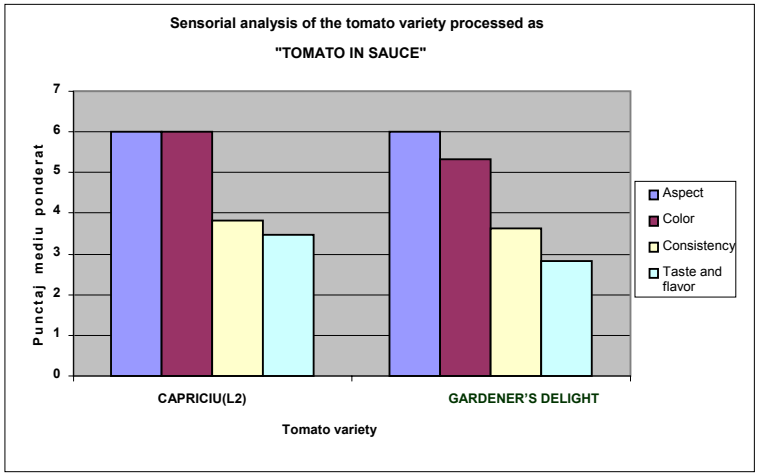
The homologation and authorization methodology of new vegetable varieties specifies that, besides their agro-biological behavior data, we must know the industrial processing behavior, as well as the physico-chemical indices that interact with the processing and destination of the varieties.

The biological material (cherry type tomatoes) was tested for the evaluation of their processing capacity by the Institute of Food Bioresources Bucharest in the framework of a CEEX Project number 76/03.10.2005 "Food safety for vegetable and fruit production and processing" by:

- industrializing capacity through thermal sterilization;
- establishing the technology of processing by dehydration;
- establishing the technology of processing by freezing techniques of the cherry type tomatoes.

OBTAINED RESULTS

The organoleptic characteristics of the cherry type tomato variety "CAPRICIU" – L2



Aspect: Undamaged tomatoes, clean, healthy, fresh aspect, firm pulp.

Equatorial section diameter: 25 – 30 mm.

Color: Red

Taste and flavor: Pleasant, characteristic for fresh tomatoes, no strange taste or flavor.

Fruit average weight (g) 21,5

Fruit height (cm) 3,4

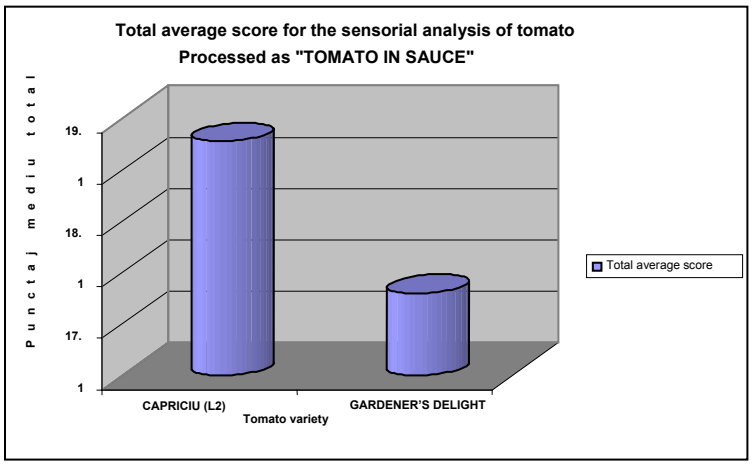
Dry soluble weight substance (^{o}R la 20 ^{o}C) 7,0

Soluble glucids (%) 4,50
Proteins (%) 0,90
Lipids (%) 0,20
Vitamin C (mg/100 g) 18,56
Total acidity (g citric acid /100 g) 0,47
Ashes (%)
- K (mg/100g) - Ca (mg/100g)
- Mg (mg/100 g) - Na (mg/100g)
- Fe (mg/100g) - P (mg/100g) 0,57
- Energetic value (kcal/100g) 23,40

As a result of the performed biochemical analyses we observed that the cherry type tomato variety L2 (CAPRICIU) have a nutritional value superior to the witness variant, GARDENER'S DELIGHT variety.

Therefore the glucid content is 41,11 % higher, the protein content 13,33 %, the lipids content 15 %, and the vitamin C content is 18,92 % higher. Regarding the mineral elements content of cherry type tomato variety L2 (CAPRICIU) compared with the witness variant, the first has a higher potassium (278,50 mg/100g beside 231,75 mg/100g), magnesium (19,75 mg/100 g beside 17,80 mg/100g), and Fe (0,44 mg/100 g beside de 0,40 mg/100g) content.

Quality indices of the product "TOMATOES IN SAUCE"- CAPRICIU – L2 variety



Organoleptic characteristics:

Product aspect: Undamaged tomatoes, (about. 7,2% cracked tomatoes);

Fruit with the same ripening degree, homogenous as dimensions, covered with homogenous mass paste, no damages

Product color: Red, deep

Pomatoes consistency: Homogenous, middle firm tomatoes, not over boiled

Taste and flavor: Pleasant, natural, very typical, very intense.
Biochemical characteristics:
Dry soluble weight substance
In tomato juice (^{o}R la 200C) 11,2
Soluble glucids (%) 7,06
Proteins (%) 0,99
Lipids (%) 0,19
Vitamin C (mg/100 g) 8,70
Total acidity (g citric acid/100 g) 0,54
Ashes (%)- K (mg/100g)- Ca (mg/100g)- Mg (mg/100 g)- Na (mg/100g)- Fe (mg/100g)- P (mg/100g) 0,50
Energetic value (kcal/100g) 33,91

Nitrate and nitrite content for cherry type tomato varieties in fresh state

L2 (CAPRICIU) VARIETY	**GARDENER'S DELIGHT (Witness)**
Nitrite ions NO_2 (mg/kg) 0,30	Nitrite ions NO_2^- (mg/kg) 0,37
Nitrate ions NO_3 (mg/kg) 112,5	Nitrate ions NO_3^- (mg/kg) 114,57

The nitrate and nitrite content of the studied cherry type tomatoes have small values (nitrites: 0,30 – 0,40 mg/kg; nitrates: 112,5 – 116,75 mg/kg), which proves the usage of adequate technologies through:

- adequate level of fertilizers applied;
- assuring light intensity;
- assuring the optimum temperature for plant growing

Compared with nitrates, the nitrites content of cherry type tomatoes is much lower, under 1 mg/kg. This situation can be explained by the fact that in the frame of the transformation processes of nitrates in plants, the nitrite phase is a transitory one. As the nitrites appear under nitratereductase's influence, they are onwards reduced, with the same speed by the nitritereductase in nitrogen monoxide.

CONCLUSIONS

The quality of the basics works, maintenance works, fertilization, phyto-sanitary treatments made and its execution at optimal moments, assure qualitative and quantitative superior yields, for both varieties of cherry type tomatoes "CAPRICIU" and "GARDENER'S DELIGHT", reducing the fuel consumption up to 10 %.

In comparison with the yield potential indicated in the specialized catalogues, the cherry type tomatoes under study, in the frame of optimized agro technical measures applied, exceeded the usual yield production potential with almost 23%, capitalizing at a superior level the soil and environment conditions, in a good year from the climatic point of view for an evolution without diseases and pest problems, economically significant. The reduced number of treatments prevented the fruit contamination with toxic residues and assured an efficient protection of plants, allowing the obtainment of an increased yield production.

From the point of view of resistance to the main diseases and pests on the quality and fruit production of cherry type tomatoes L2 (CAPRICIU) and GARDENER'S DELIGHT – in greenhouses) – this year's climatic conditions didn't favor the apparition of the specific pathogens in the case of cherry type tomato culture, as: *Alternaria porri f. sp. solani*- early blight of tomato leaves*, Botrytis cinerea* - grey mould of tomatoes, *Cladosporium fulvum* – leaf mould of tomato. The new variety of cherry type tomato fits the quality and performance criteria demanded on the national market, for alignment to the requirements on the European Union market.

The new variety will find his place in people's diet, as fresh product and also in processed state.

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STUDIES CONCERNING MICOBIOTA FROM DIFFERENT NUTRITIOUS PROPOSE SUBSTRATUM FOR THE CULTIVATION *LYCOPERSICUM ESCULETUM* SEEDLING

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Keywords: soil, deuteromycota, filamentous fungi, culture *in vitro*

ABSTRACT

All taxonomic groups of fungi are represented in soil. Most are not pathogenic to plants. However, pathogenic fungi may be isolated from soil by a variety of methods such as using selective media, natural host tissues onto which they will grow, or soil dilution and plating, to name a few. *Pythium* species are rapidly growing fungi that require minimal nutrition for growth of hyphae. They are members of the *Oomycetes* or water molds. The *Fusarium* grow rapidly on PDA at 25°C and produce woolly to cottony, flat, spreading colonies.

INTRODUCTIONS

The fungi represent in certain types of soils a component an importance from mass microbial. They integrated in the group of native his all ochthonous organisms, having a different role putrescent the organic matter. Many species produced aromatic substance like of the lignins, having a different role in the formation of the humus.

As per infallible principle the any substances is degradation of his microorganisms of a groups of microorganisms, in favourable conditions of medium. In this context, microfungi remarked through extraordinary power them can degraded especially numerous xenobiotic substances (Mihaescu, 2007).

The results of this paper are part of the research project of Alternative technologies to obtain multiplied material for ecologic plantations.

MATERIALS AND METHODS

The morphological characters of the fungi, were studious utilisation the proofs of vegetable material which emphasized the conidiomata, through counting, specify colorations and the assembling in microscopic preparations, but and through the isolation in pure lettered the si the determination peculiarities *in vitro*.

In these process observations of laboratory we following aspects such as: the formation conidiomata, form and these size; form, the colour and the sizes of the spores; form, the sizes, the appearance and the colour of the colony; growth of the colonies; the appearance somatic hyphae; the moment formation conidiomata on the medium PDA and the types of the sporogenesis.

For the study micobiota the used-up soil the lettered table-like method Petri (Constantinescu, 1974). The isolation in the culture pure, he did in flasks Petri with medium PDA (potato dextrose agar) standard (40 g medium to 1000 ml the distil water).Collection of probations of soils he made in purses of paper, with of a help metallic spatulas, and the instruments and material used-up were sterilized preliminarily. Collection of probations he did from the depth of 10 cm, there to they were processing through trituration and in a sterile

homogenization. From each the proof weighing 1 g of which were used-up to obtained decimal dilutions from 10^{-1} to 10^{-6}, for of a obtained the optimum number of colonies.

RESULTS AND DISCUSSIONS

Majority of which fungi they developed into the proofs do the part from the group of the fungi with potential micotoxigen (table 1, fig. 3).

Predominantly in the experimental were the genus *Fusarium*, a kind of filamentous fungi which comprises an impressive number of pathogenetic species to the plants of the culture which proofs with jiffy-pot abounded in differently species of the genus *Penicillium*. Conversely to the proof three proposed for the effectuation of nutritious were put in evidence the fungus *Pythium* sp. a pathogen of extravagantly aggressive soil, associated the root rot of seedlings.

The main morphological characters observed to the fungi:

» ***Alternaria*** is a cosmopolitan dematiaceous fungus commonly isolated from plants, soil, food, and indoor air environment (fig. 2, 4). The production of melanin-like pigment is one of its major characteristics. The dark brown spores are borne in simple or branched chains from the tips of simple dark conidiophores and are divided into several cells by transverse and vertical walls.

» ***Fusarium*** is a filamentous fungus widely distributed on plants and in the soil. It is found in normal mycoflora of commodities, such as rice, bean, soybean, and other crops. Hyaline septate hyphae, conidiophores, phialides, macroconidia, and microconidia are observed microscopically. Macroconidia are 2- or more celled, thick-walled, smooth, and cylindrical or sickle shaped. Microconidia are 1-celled (occasionally 2- or 3-celled), smooth, hyaline, ovoid to cylindrical, and arranged in balls (occasionally occurring in chains). Chlamydospores, when present, are sparse, in pairs, clumps or chains. They are thick-walled, hyaline, intercalary or terminal (fig. 5).

» ***Cladosporium*** is a dematiaceous mould widely distributed in air and rotten organic material and frequently isolated as a contaminant on foods. Conidia of *Cladosporium* spp. in general are elliptical to cylindrical in shape, pale to dark brown in color. They occur in branching chains that readily disarticulate. Conidial wall is smooth or occasionally echinulate.

» ***Penicillium*** are widespread and are found in soil, decaying vegetation, and the air. For species of *Penicillium*, septate hyaline hyphae, simple or branched conidiophores, metulae, phialides, and conidia are observed.

» ***Mucor*** is a filamentous fungus found in soil, plants, decaying fruits and vegetables. Nonseptate or sparsely septate, hyphae, sporangiophores, sporangia, and spores are visualized.

» ***Pythium*** is a genus of parasitic oomycete. An oogonium will be fertilized by an antheridium result is a thick, double-walled oospore. Asexual reproductive structures are sporangia globose to oval or may have an irregular shape.

» ***Geotrichum*** is a yeast found worldwide in soil, water, air, and sewage, as well as in plants, cereals, and dairy products. Arthroconidia and coarse true hyphae are observed. Blastoconidia, conidiophores and pseudohyphae are absent. Arthroconidia are unicellular, in chains, hyaline, and result from the fragmentation of undifferentiated hyphae by fission through double septa.

Table 1. Fungic load from the proofs of soil

Proof soil Fungi	**Jivipot**	**Nutritious definitive mixture**	**Suggested proofs for the effectuation of nutritious mixture**		
			proof 1	**proof 2**	**Proof 3**
Absidia	0	0	0	0	0
Cunninghamella	0	0	0	0	0
Mortierella	0	0	0	0	0
Mucor	0	0	+	+	0
Rhizopus	0	0	0	0	0
Pythium	0	0	0	0	+
Chaetomium	0	0	0	0	0
Alternaria	0	0	0	0	+
Aspergillus	0	0	0	0	0
Botrytis	0	0	0	0	0
Cephalosporium	0	0	0	0	0
Cladosporium	+	0	0	0	0
Curvularia	0	0	0	0	0
Fusarium	0	+	+	+	+
Geotrichum	0	0	0	+	0
Myrothecium	0	0	0	0	0
Penicillium	+	0	0	+	0
Phoma	0	0	0	0	0
Trichoderma	0	0	0	0	0
Tubercularia	0	0	0	0	0
Verticillium	0	0	0	0	0

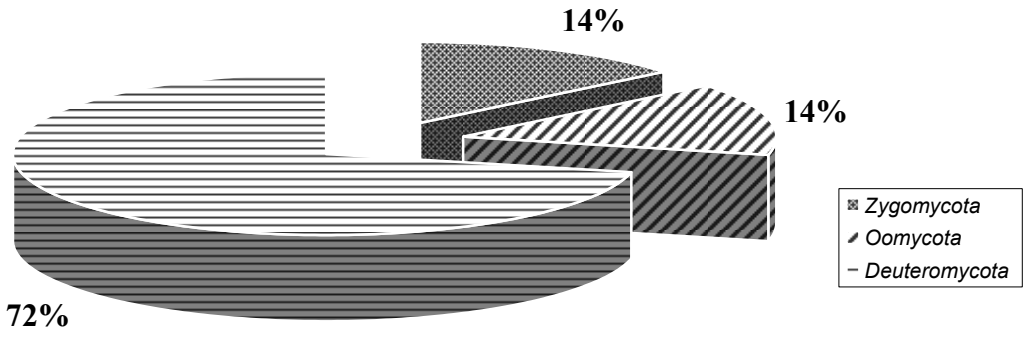

Fig. 1. The qualitative weight of fungi from the proofs of soil

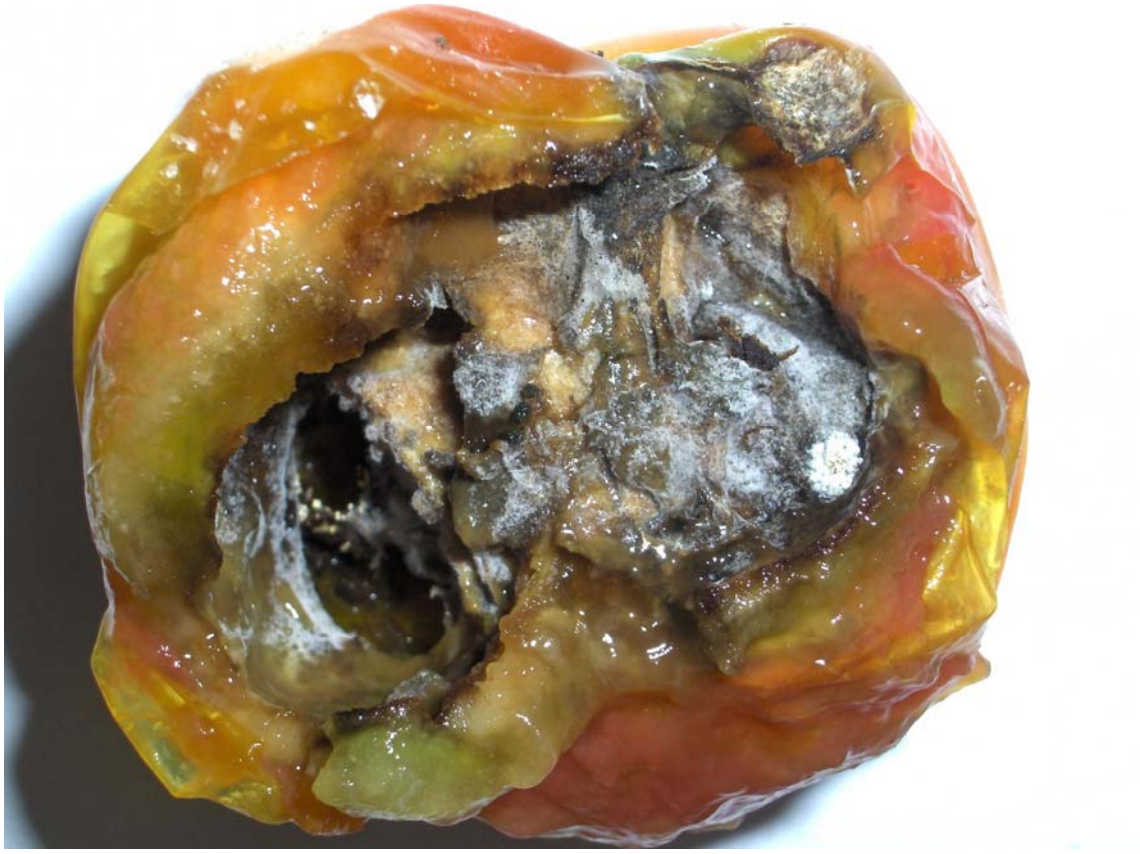

Fig. 2. The *Helicoverpa armigera* and *Alternaria solani*

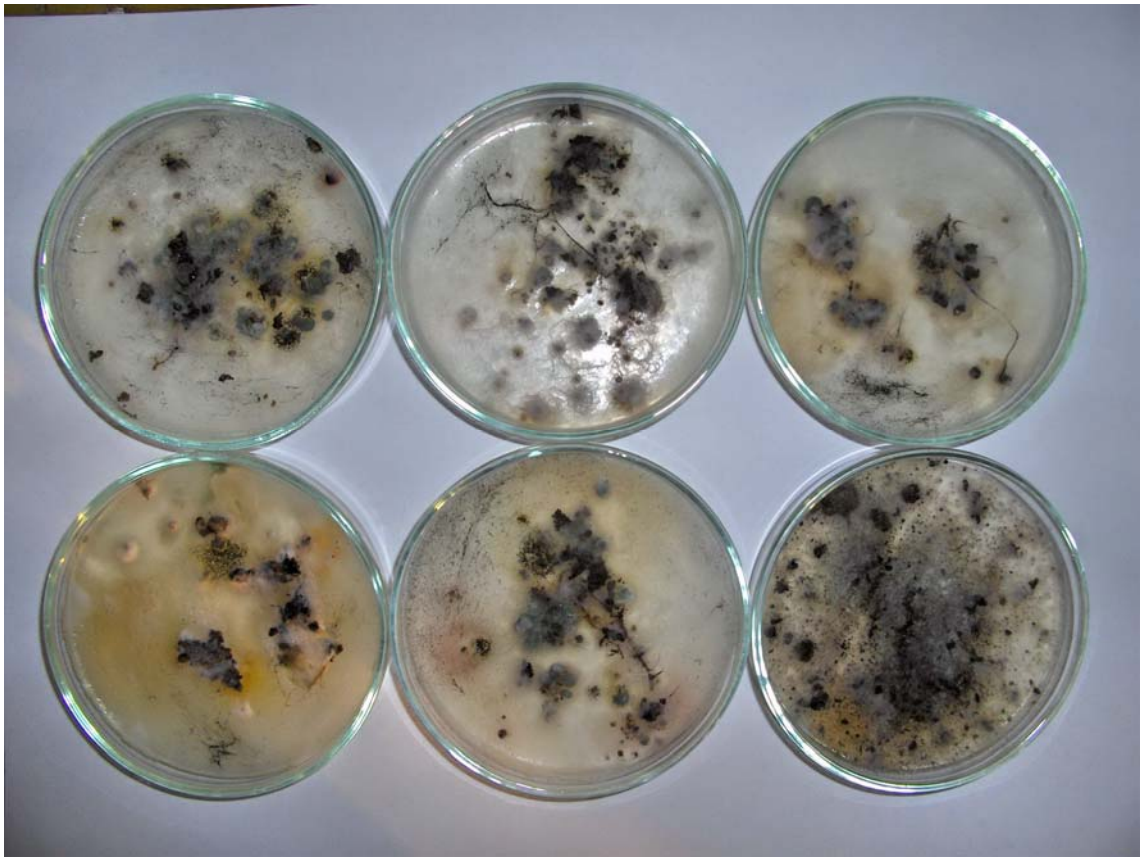

Fig. 3. *In vitro* culture of fungi from soil

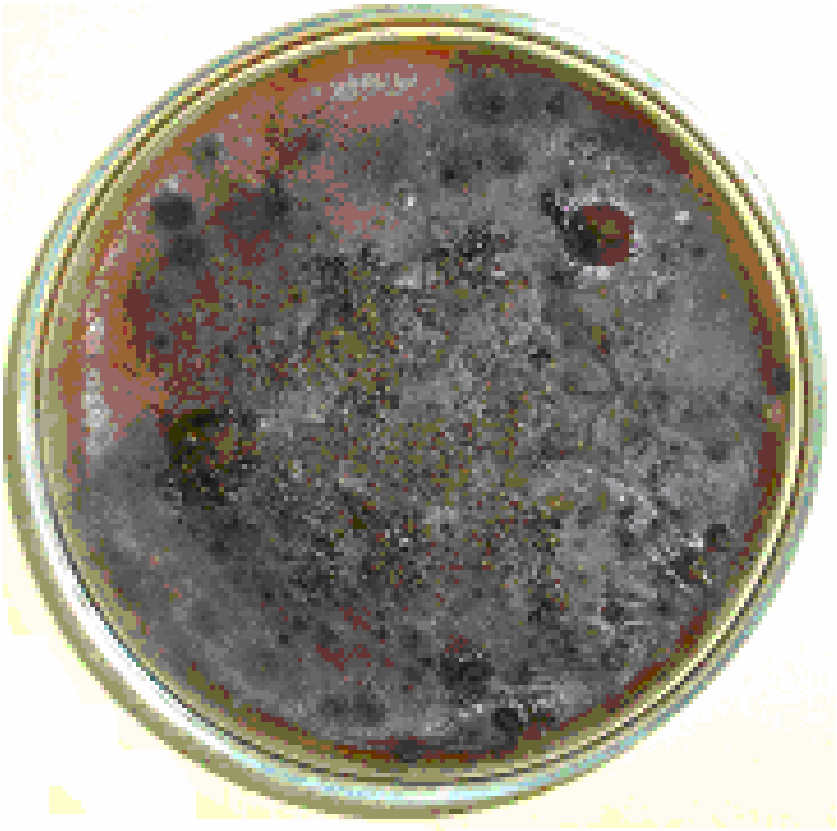

Fig. 4. *In vitro* culture of *Alternaria*

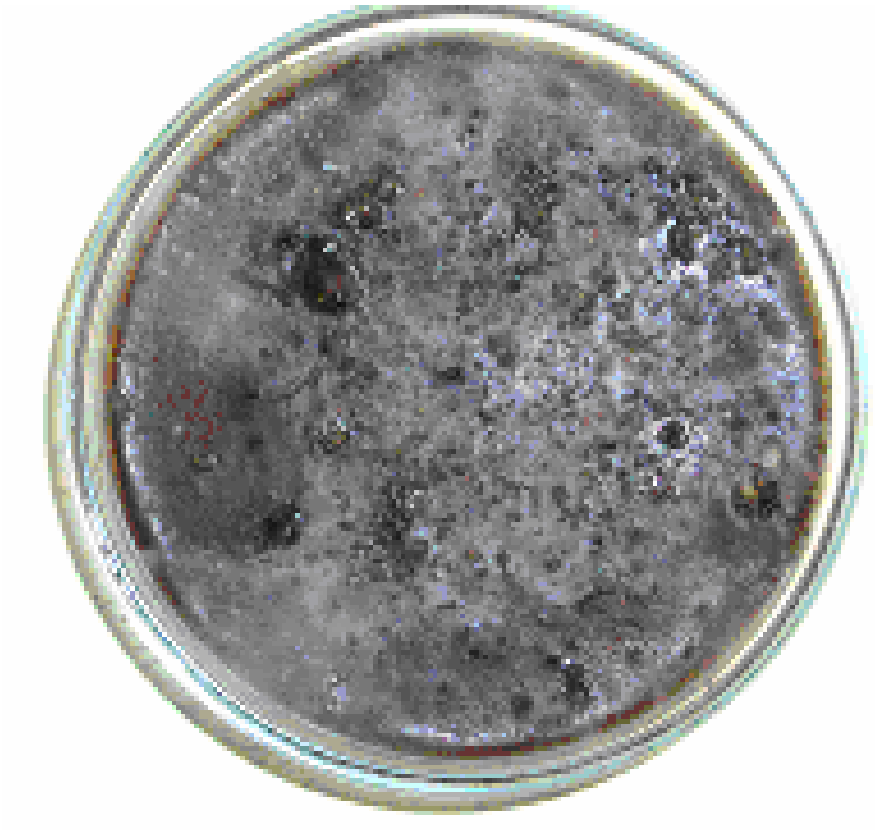

Fig. 5. *In vitro* culture of *Fusarium*

CONCLUSIONS

The fungi observed does the part from micoflora specify the majority of the soils from Muntenia.

Majority of which fungi they developed into the proofs do the part from group of the fungi with potential mycotoxin.

He appreciated, through the using methodology, as preponderant fungus in the proofs of soil belongs to the genus *Fusarium*.

In our researches not were emphasize antagonistic species (*Trichotecium*, *Trichoderma*).

The determination of micromicetous existing in the experimental variants was the presences the fungi from taxonomic different groups.

He needs so that he is granted a special attention of treatments to soil in all the period of future vegetation cultures.

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IRRIGATION SCHEDULING IN TOMATOES' SOLARIUM CROPS

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Keywords: Piche evaporimeter, Piche evaporation, crop coefficient, water balance, water consumption.

ABSTRACT

The paper is based on the researches carried out during 1999-2001 in the solariums from Husasău de Criş, Bihor County. The direct link, statistically assured, between tomatoes' daily Piche evaporation and daily water consumption emphasized the opportunity of the Piche evaporimeter use in tomatoes' irrigation scheduling in solarium conditions. The use is based on the soil's water balance on 0-50 cm depth in the monthly chart using daily data of the Piche evaporation and the specific crop coefficient "Kc". In average of the studied period, the values of the crop coefficient were of: 0.75 in March, 0.51 in April, 0.66 in May, 0.76 in June, 0.90 in July, 0.62 in August and 0.64 in September.

INTRODUCTION

The Piche evaporimeter is used in the field crops' irrigation scheduling in France and Italy. Since 1969, this method is studied in some research fields from the potentially irrigated areas of Romania (Grumeza et all, 1989, Domuța, 1995, 2005. Our research evidenced the results obtained when using the Piche evaporimeter for tomatoes' irrigation scheduling solarium conditions.

MTERIALS AND METHODS

The researches were carried out during 1999-2001 in the conditions of the solarium from Husasău de Tinca. The solarium area was of 200 m^2; three Piche evaporimeters were placed in the middle of the solarium. The levels of the water from Piche evaporimeter were noted down every day at 8 o'clock in the morning and compared to those predetermined; the final values of the Piche evaporimeter were obtained (Table 1).

Regarding the temperatures outside the solarium, the lowest values were registered in April, but the highest temperatures were registered in July (1999 and 2000) and in August (2001).

The optimum tomatoes' water consumption was obtained by maintaining the soil's water reserve on the watering depth (0-50 cm), between the easily available water content and the field capacity. This thing was possible by prelevating soil samples ten to ten days and determining its soil moisture; the soil moisture was determined monthly, on 0-150 cm depth. Tomatoes' water consumption was determined using the soil water balance method, the depth considered was 0-150 cm.

The Piche evaporimeter method is one of the indirect methods for irrigation scheduling. The indirect methods for irrigation scheduling are based on the crop coefficient (Kc).Crop coefficients (Kc) are calculated reporting the optimum water consumption to the reference evapotranspiration (ET_o), Piche evaporation in our case.

RESULTS AND DISCUSSION

Piche evaporation

The analysis of the monthly average of the Piche evaporation emphasizes a different situation in every year of the researched period.

In 1999, monthly values had a constant increase from March (3.91 mm/day) to July (7.64 mm/day); after that the values decreased. The biggest variation interval was registered in August. In 2000, the values of the Piche evaporation increased from March (3.55 mm/day) to June (6.76 mm/day), in July a smaller value (6.05 mm/day) was registered, in August the biggest value was determined (7.54 mm/day) and in September the smallest value (2.95 mm/day) was registered. The biggest variation interval of the daily Piche evaporation was registered in August. In 2001, the situation was different, in May a first top of the monthly values was registered and in July, the second; the biggest variation interval was registered in September (table 2).

The average of the studied period indicates values from 3.76 mm/day in March to 6.71 mm/day in July and a decrease of the Piche evaporation in August (6.51 mm/day) and in September, 3.22 mm/day.

Tomatoes' water consumption

In order to maintain the soil's water reserve on 0-50 cm depth between the easily available water content and the field capacity a specific irrigation regime was used every year: 464 mm/ha and 15 rates in 1999, 591 mm/ha and 19 rates in 2000, 479 mm/ha and 14 rates in 2001. The highest monthly irrigation rates were registered in July: 139 mm/ha in 1999, 164 mm/ha in 2000 and 125 mm/ha in 2001 (table 3).

The total water consumption values were of 669 mm/ha in 1999, of 818 mm/ha in 2000 and 640 mm/ha in 2001. Irrigation was the main source of the water consumption covering. From soil reserve tomatoes used 185 mm/ha, 27.6% from total water consumption. The biggest quantity of water used from soil reserve was registered in 2000, 22.7 mm/ha (27.7% from total water consumption). In 2001, the smallest water quantity, 161.0 mm/ha (25.1% from total water consumption) was registered (table 4).

Specific values of the tomatoes' daily water consumption were registered. All the years the maximum value was registered in July: 5.94 mm/day/ha in 1999, 6.58 mm/day/ha in 2000 and 5.29 mm/day/ha in 2001 (table 5).

The correlation between the Piche evaporation and the daily water consumption of the tomatoes

There is a direct link between the daily Piche evaporation and the daily water consumption of the tomatoes. Mathematically, the expression of this link is $y = 0{,}3972x^2 - 3{,}0985x + 8{,}2299$ and the correlation coefficient is $R^2 = 0{,}8079$.

Crop coefficient Kc

The values of the crop coefficients Kc for transformation of the Piche evaporation in optimum water consumption have specific values for every month of the studied years. In every year, the biggest value was registered in July: 0.78 in 1999, 1.09 in 2000 and 0.82 in 2001 (table 6).

Irrigation scheduling using the Piche evaporimeter

The use of the Piche evaporimeter in tomatoes' irrigation scheduling in the solarium conditions is based on the monthly chart regarding the soil water balance on the watering depth, 0-50 cm in our case. Soil water reserve must be determined only once in the tomatoes planting day. In the next days of the tomatoes vegetation period, the soil water reserve is obtained by using a calculation method. For example:

- tomatoes plating days: 27.03
- soil water reserve: 141 mm/ha

- Piche evaporation in 27.03 = 3.0 mm/day
- crop coefficient for March = 0.75
- optimum water consumption = 3.0 x 0.75 = 2.25

After the calculation, a soil water reserve is obtained at the end of the day 27.03. This example is presented in figure 1.

CONCLUSIONS

The Piche evaporimeter can be used in the solarium tomatoes crops' irrigation scheduling because the relation between the daily Piche evaporation and tomatoes' water consumption is statistically assured.

Three evaporimeters placed in the middle of the solarium are recommended. The height of the evaporimeter's place is 1.7 m.

The Piche evaporimeter use in the irrigation scheduling of the tomatoes is based on the soil water balance of 0-50 cm depth and on the use of the specific crop coefficient Kc. In average of the period 1999-2001, the values of the crop coefficient are: 0.75 in March, 0.51 in April, 0.66 in May, 0.76 in June, 0.90 in July, 0.62 in August and 0.64 in September.

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Tables

Table 1. Average values of the air temperature inside and outside the solarium, Husasău de Tinca 1999-2001

Year	Place of determination	March	April	May	June	July	August	September
1999	Inside solarium	16.5	17.8	18.7	23.0	31.2	26.1	22.2
	Outside solarium	12.8	11.9	15.0	20.6	24.2	21.2	17.6
2000	Inside solarium	1.5	19.4	22.6	24.8	27.3	27.4	22.8
	Outside solarium	10.5	14.7	17.9	21.5	25.9	25.1	19.3
2001	Inside solarium	14.8	16.4	21.4	19.9	22.4	26.0	20.2
	Outside solarium	10.5	10.5	16.7	16.2	18.7	22.3	15.8
Average	Inside solarium	15.6	17.9	20.9	22.6	27.0	26.5	21.7
	Outside solarium	11.3	12.4	16.5	19.4	22.9	22.9	17.6

Table 2. Piche evaporation values (mm/day) in the solarium conditions, Husasău de Tinca 1999-2001

Year	Specification	March	April	May	June	July	August	September
1999	Average	3.91	5.67	5.96	6.33	7.64	5.62	3.10
	Variation interval	3.7-4.1	4.6-6.6	4.8-6.7	5.8-6.7	6.2-8.7	3.8-7.9	2.2-3.4
2000	Average	3.55	5.8	6.49	6.76	6.05	7.54	2.95
	Variation interval	3.1-4.0	4.0-6.9	5.9-7.4	6.1-7.5	5.7-6.4	5.5-8.4	2.0-4.9
2001	Average	3.83	5.06	5.62	5.40	6.44	6.36	3.6
	Variation interval	3.5-4.2	3.7-5.9	5.5-6.5	5.1-5.9	5.7-7.1	6.1-6.9	2.3-5.7
Average		3.76	5.51	6.02	6.16	6.71	6.51	3.22

Table 3. Irrigation regime used in tomatoes to maintain the soil water reserve on 0-50 cm between easily available water content and field capacity in the solarium conditions, Oradea 1999-2001

Year	March		April		May		June		July		August		September		Total	
	Σm	n	Σm	n	Σm	n	Σm	n	Σm	n	Σm	n	Σm	n	Σm	n
1999	30	1	35	1	82	3	97	3	139	4	102	3	-	-	484	15
2000	30	1	35	1	92	3	101	4	164	5	137	4	32	1	591	19
2001	30	1	31	1	70	3	92	3	125	4	110	2	30	1	479	14
Average	30	1	33.6	1	81	3	97	3	143	4	113	3	21	1	518	16

Table 4. Total water consumption [Σ(e+t)] and covering sources in the tomatoes crop from solarium, Husasău de Tinca 1999-2001

Year	Σ(e+t) mm	Covering sources of the water consumption			
		Soil water reserve		Irrigation	
		mm	%	Mm	%
1999	669	185	27.6	484	72.4
2000	818	227	27.7	591	72.3
2001	640	161	25.1	479	74.9
Average	709	191	26.9	518	73.1

Table 5. Daily water consumption of the tomatoes in the condition from the solarium, Husasău de Tinca

Year	March	April	May	June	July	August	September
1999	2.92	2.92	3.97	4.47	5.94	3.77	1.6
2000	3.09	3.09	4.42	5.36	6.58	4.35	3.05
2001	2.38	2.38	3.47	4.26	5.29	3.94	1.28
Average	2.8	2.8	3.96	4.70	5.93	4.02	1.98

Table 6. Crop coefficient (Kc) for transformation of the Piche evapotranspiration in tomato optimum evapotranspiration in the solarium conditions, Husasău de Tinca 1999-2001

Year	March	April	May	June	July	August	September
1999	0.75	0.54	0.67	0.71	0.78	0.67	0.52
2000	0.87	0.53	0.68	0.79	1.09	0.58	1.03
2001	0.62	0.47	0.62	0.79	0.82	0.62	0.36
Average	0.75	0.51	0.66	0.76	0.90	0.62	0.64

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PRELIMINARY STUDY REGARDING THE WAY TO PRODUCE LETTUCE TRANSPLANT ON YIELD

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Keywords: lettuce, transplant, size, container

ABSTRACT

The study was realized in warm greenhouses at the Faculty of Horticulture from Bucharest during February and March months 2007. As a material, we used different types of pots: V1 (Mt) – nutritive cubes with 5 cm length; V2 –Jiffy pot, container with 4.5-cm maxims diameter; V3 – Jiffy pot, container with 4.0 cm maxims diameter; V4– alveolar pallets (cells) with 3.0 cm diameter and V5 alveolar pallets (cells) with 2.5 cm diameter. We made some observations during the nurseling growth regarding this growth. To notice the differences between variants, we made some determinations regarding the height, the number of leaves, the total mass, the radicular number at the nurseling obtained in different types of pots.
The purpose of the study was to appreciate the quality of the nurseling grown on the nutritive Plantaflor substrate and to recommend to the producers the most convenient variant of producing the nurseling.

INTRODUCTION

Different researchers were interested in getting lettuce nurseling in the most profitable ways. The getting of some lettuce plants according to the actual standards in a shorter period represents a great advantage for any lettuce producer. The choice of the most suitable nutritive pot for getting lettuce nurseling can influence its quality, its temporality and finally the total production.

In this study, we followed the influence of nutritive pot size on the lettuce nurseling and the edible mass size with the purpose of choice and recommendation to the producers the best variant.

MATERIAL AND METHOD

The study was realised in warm greenhouses at Faculty of Horticulture from Bucharest, during February and April months 2007.

In present study we use as Lollo bionda cultivar. The transplant was obtained in warm greenhouse 17 February and 27 March. This was transplanted in nutritive cubes, pots and alveolar pellets having different volumes.

The experimental variants were:

V1 (Mt) – nutritive cubes with 5 cm length;

V2 – Jiffy pot, container with 4.0 cm maximum diameter;

V3 – alveolar pallets (cells) with 3.0 cm diameter;

V4– alveolar pallets (cells) with 2.5 cm diameter.

The often sowing regarding transplanted was realised in cubes on 2th of March. For sowing and transplanting we used the peat nutritive substrate of Sphagnum, bought by Plantaflor from Covasna. The composition of substrate for sowing was the following: 50% black peat and 50% white peat, N 120 mg/l, $P_2O_5$140 mg/l, K_2O160 mg/l, Microelements B, Fe, Cn, Mn, Mo, Zn, pH5,5 – 5,8, Salts content 1 g/l , fertiliser 1 g/l. For transplanting we used this substrat with the following composition: 25% white peat and 75% black peat; N 120

mg/l; P_2O_5 140 mg/l; K_2O160 mg/l; Microelements B, Fe, Cn, Mn, Mo, Zn; pH5,5 – 5,8, salts content 1 g/l. During the nurseling growth, we realised care works recommended by the frame technology which followed the assurance of temperature, light, and the humidity suitable for the vegetation.

The nurseling planting was realised on 20th of March 2007, in unwarmed greenhouse after the following plan: 25cm distance between lines and 20cm between plants on line.

We observed and determined the growth in dynamics of the lettuce nurseling from 10 to 10 days. Before planting, we made some determinations on the nurseling of 30 days, regarding the nurseling height, the number of leaves, the total mass of the nurseling, the radicular volume.

We also made some observations in culture regarding the growth of plants in diameter and in the time we recorded the number of leaves. We also determined the total average and edible mass of lettuce plants.

The dates were statistically interpreted using the analysis of variant.

RESULTS AND DISCUSSIONS

Analyzing the obtained results, we could appreciate that the lettuce nurseling of 30 days presented significant differences regarding the height. This differs between 11.31 cm at V_1 and 10.39 cm at V_4. The number of leaves formed at lettuce nurseling varied between 4.15 at V_4 and 5.33 at V_1. The foliar surface was the smallest at V_4 of 20.40 cm^2 and 39.71 cm^2 at V_1. The smallest radicular volume was recorded at V_4 of 1.55 cm^3, the variant with the smallest pot dimension (alveolar pallet), and the biggest of 3.31cm at V_1, with the biggest dimension of the alveol (table no.1).

The calculation of variant analysis regarding the nurseling height at 30 days presented negative values at V_4, at the smallest dimension of the pot, compared to V_1 taken as a witness (tabel no 2).

From statistically negative point of view, the number of leaves at lettuce nurseling was very significant at V_4 (table no 3).

The radicular volume was significant at V_2 and negatively very significant at V_4 (table no 4).

Negatively significant differences were recorded at variants 2, 3 and 4 compared to V_1 taken as a witness, for foliar surface (table no 5).

According to the results obtained and presented in table no 6, we noticed that the edible mass of lettuce plants, at the age of 60 days, was over the minimum STAS value of 100g at the most of the experimental variants. The smallest value was recorded at V_4, of 101.00g, with about 46% smallest compared to V_1 where we obtained an edible average mass of 144g. Negative significant differences were recorded at variants 3 and 4 and negatively very significant at V2.

CONCLUSIONS

The average height of the nurselings was lowest at variants produced in pots of smaller dimensions.

The smallest foliar surface at radicular volume, we obtained at the nurseling produced in pots of smaller dimensions.

The usage of nutritive pots of bigger dimensions has as a result the getting of an average mass of lettuce, going bigger in a shorter period of time.

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Table 1. The characteristics of lettuce nurseling at planting (at the age of 30 days)

Variants	Height *	No. of leaves **	The volume of radicular system ***	The foliar surface ****
	cm	no.	cm^3	cm^2
V1(control)	11.31	5.33	3.31	39.71
V2	10.95	5.07	4.24	31.23
V3	10.72	4.60	2.50	22.36
V4	10.39	4.15	1.55	20.40
* **F theoretic = (001%= 24.92348) ; (0.1%= 10.01851) ; (5%= 4.815314) Experience significance***				
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Table 2. The analysis of variant regarding the height of lettuce nurseling at Lollo Bionda

Variants	Height	Difference		Significance
	(cm)	(cm)	(%)	
V(0) Average	10.84	-0.47	95.87	O
V1(control)	11.31	0.00	100.00	Control
V2	10.95	-0.36	96.82	N
V3	10.72	-0.59	94.78	O
	10.39	-0.92	91.86	OO
DL5% = 0.450	**DL5% in % = 3.9800**			
DL1% = 0.680	**DL1% in % = 6.0142**			
DL01% = 1.090	**DL01% in %= 9.6403**			

Table 3. The analysis of variant regarding the number of leaves at lettuce nurseling

Variants	No leaves	Difference		Significance
	(cm)	(cm)	(%)	
V(0) Average	4.79	-0.54	89.82	OO
V1(control)	5.33	0.00	100.00	Control
V2	5.07	-0.26	95.12	N
V3	4.60	-0.73	86.30	OO
V4	4.15	-1.18	77.86	OOO
DL5% = 0.310	**DL5% in % = 5.8161**			
DL1% = 0.470	**DL1% in % = 8.8180**			
DL01% = 0.760	**DL01% in %= 14.2589**			

Table 4. The analysis of variant regarding the radicular volume at lettuce nurseling

Variants	Radiculary volume	Difference		Significance
	(cm)	(cm)	(%)	
V(0) Average	2.90	-0.41	87.64	N
V1(control)	3.31	0.00	100.00	Control
V2	4.24	0.93	128.20	*
V3	2.50	-0.81	75.63	N
V4	1.55	-1.76	46.73	OO
DL5% = 0.910	**DL5% in % = 27.4924**			
DL1% = 1.380	**DL1% in % = 41.6918**			
DL01% = 2.200	**DL01% in %= 66.4653**			

Table 5. The analysis of variant regarding the foliar surface at lettuce nurseling

Variants	Foliar surface (cm^2)	Difference		Significance
		(cm)	(%)	
V(0) Average	28.42	-11.28	71.59	OOO
V1(control)	39.71	0.00	100.00	**Control**
V2	31.23	-8.47	78.66	OOO
V3	22.36	-17.35	56.30	OOO
V4	20.40	-19.31	51.38	OOO
DL5% = 3.470	**DL5% in % = 8.7391**			
DL1% = 5.250	**DL1% in % = 13.2220**			
DL01% = 8.360	**DL01% in %= 21.0544**			

Table 6. The analysis of variant regarding the edible average mass at Lollo Bionda

Variants	Edible mass	Difference		Significance
	g	g	%	
V(0) Average	144.00	-43.00	77.01	OOO
V1(Control)	187.00	0.00	100.00	Mt
V2	161.67	-25.33	86.45	OO
V3	126.33	-60.67	67.56	OOO
V4	101.00	-86.00	54.01	OOO
DL5% = 10.920	**DL5% in % = 5.8396**			
DL1% = 16.520	**DL1% in % = 8.8342**			
DL01% = 26.310	**DL01% in %= 14.0695**			

Fig. 1. Plants of lettuce harvested after 30 days from planting

Lucrări ştiinţifice U.S.A.M.V.B., Seria B, Vol. L, 2007

STUDIES REGARDING THE PHYSIOLOGY OF TWO TOMATO CULTIVARS, IN DIFFERENT VOLUME OF SOIL

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Keywords: *Lycopersicum esculentum, dry weight, photosynthesis, foliar pigment, different pots, microbiota*

ABSTRACT

The purpose of our paper is to study the main physiological processes at Lycopersicum esculentum. We used cultivars Pablo and Heinz. Our cultivars were planting in the big and small pot. We determined gas exchange process rates, respiration of soil, pH of soil, and length of root. Also, we determined the number of viable bacterial cells in the same pots. There was a significant difference regarding the physiological aspects. The capacity a pot influenced the main physiological indicator and the number of bacteria.

INTRODUCTION

The intensity of photosynthesis has a maxim level when the leaves of tomato has 30-50% from normal surface (Ludwig and Withers, 1984) and the productivity of the photosynthesis is variable with the agro technique conditions (Patron, 1981). Intensity of photosynthesis in normal conditions is 12,9 μmol/ m^2/ s (Galtier et al, 1995). Normal temperature to have good photosynthesis is between 25 and 30 °C (Augustine et al, 1976). The rate of respiration at young leaves from the top of plant has the maximum level. The rate of respiration depends on the level of temperature (Gosiewski et all, 1982). Photosynthetic intensity, transpiration and stomata resistance of tomato plant leaves were studied at various light intensities and temperatures in the root zone (KOSOBRUKHOV et al, 2000) Effect of various light and temperature regimes in the root zone on the light stage of photosynthesis, gas exchange, growth processes and absorption of mineral nutrients by tomato plants were studied by KOSOBRUKHOV et all, 2002).

MATERIAL AND METHODS

In our research we had the scope to study the main physiological process at *Licopersicum esculentum* planting in different pots with variable capacity (big and small pots – figure 1). We used the cultivars Pablo and Heinz. This paper reports physiological aspects at leaves and soil.

We determined:

- photosynthesis rate (manometric method);
- respiration rate (manometric method);
- pH of soil;
- respiration of soil;
- length of root;
- the number of viable bacterial cells.

Fig. 1. Tomato growing in the small and big pots

We used indirect determination of number of viable bacterial cells method for estimation of soil microbiota. We obtained serial dilution of soil samples in sterile physiological water, which were used like inoculum for incorporation in solid medium.

We observed the colonies for each dilution with colony counter Funke Gerber after 5 days at 22^{o}C. We established the medium number of viable bacterial cells per 1 gram of soil for each sample of soil.

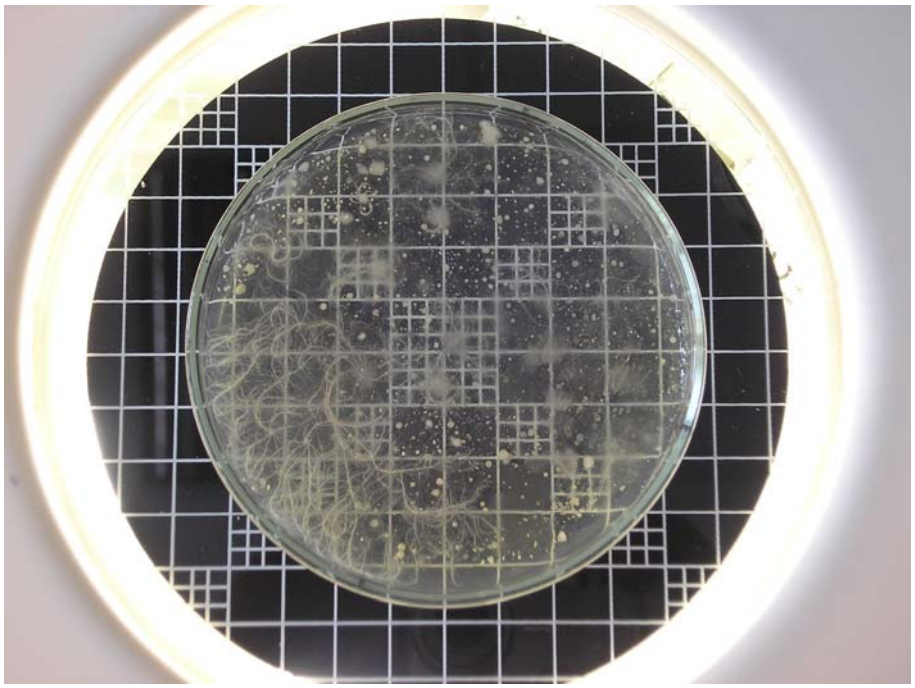

Fig. 2. Bacterial colonies (colony counter Funke Gerber)

RESULTS AND DISCUSSION

In the figure 3 we have the rate of intensity. We can see that the Pablo cultivars register the high level in the big pot. Between cultivars and capacity of pot exist significant difference.

Regarding the respiration intensity, all of studied cultivars present bigger value in the big pot (figure 4). The statistical interpretation doesn't have a significant difference between cultivars planting in the same pots but between variants of pots used exist significant differences.

The impact of pot capacity on respiration of soil registered the higher level in the big pots where the Heinz genotype was planted. There are significant differences.

Length of root has a bigger value in the big pot. Between capacities of pot, length of roots registered significant differences.

Figure 7 present the level of soil pH. The statistical interpretation show significant differences for $p<0,05$.

CONCLUSIONS

1. In principle, the main physiological indicators have bigger values in the pots with ore capacity. The capacity of pots influenced the physiological aspects of genotypes studied.
2. Significant positive correlation exists between intensity of respiration, intensity of photosynthesis, foliar pigment, leaves surface, and between the volume and length of root.
3. The number of viable bacterial cells per 1 gram of soil was bigger in the big pots than the smaller one for Heinz cultivar and for Pablo cultivar too. We appreciate that the volume of soil influenced the microbiota and the cultivars don't.

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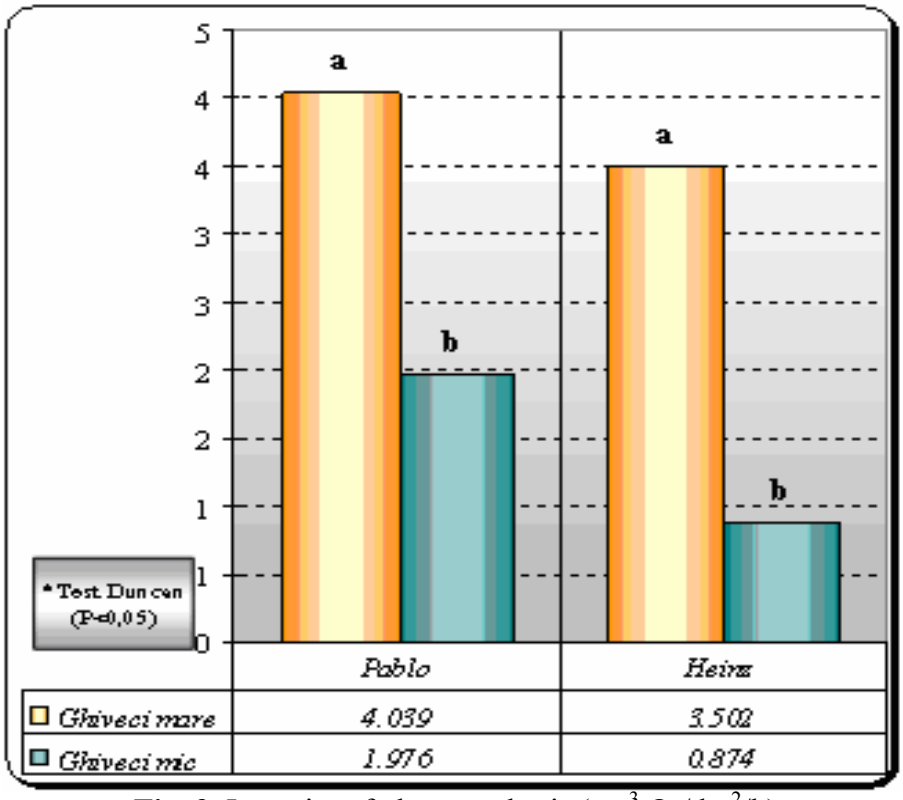

Fig. 3. Intensity of photosynthesis (cm^3 $O_2/dm^2/h$)

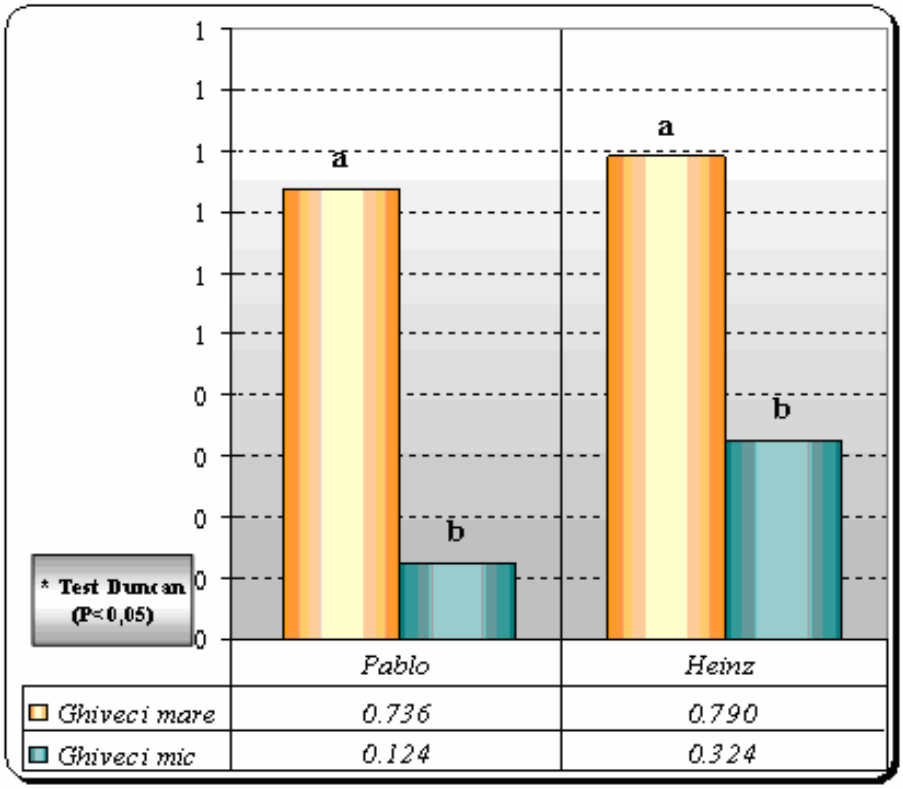

Fig. 4. Rate of respiration (cm^3 $O_2/dm^2/h$)

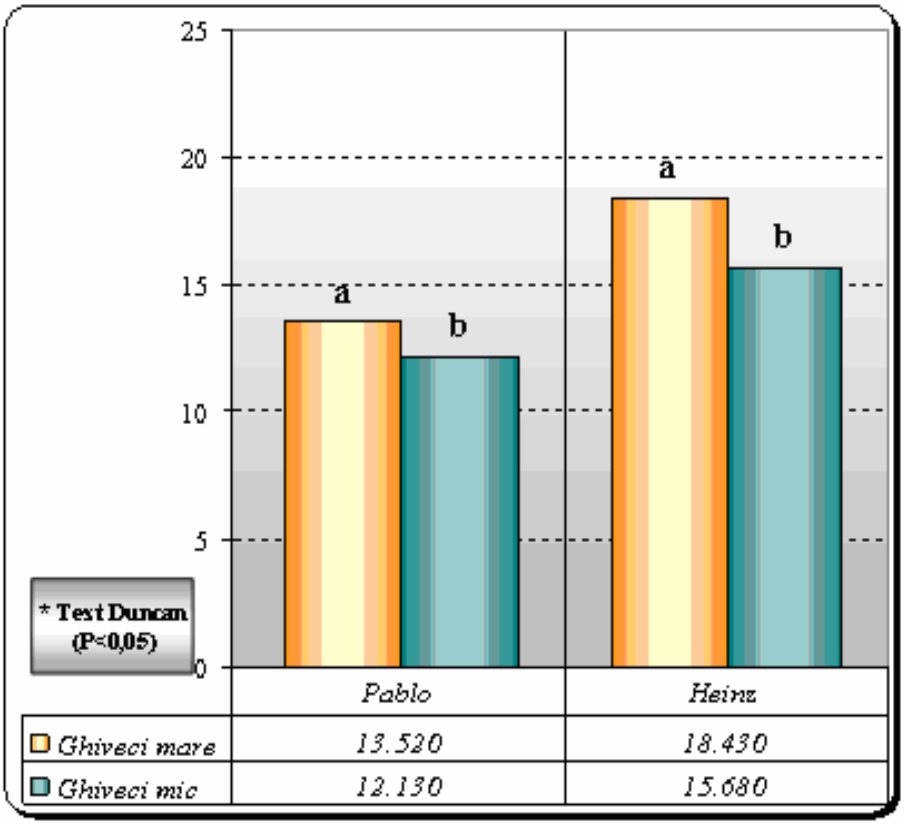

Fig. 5. Length of root (cm)

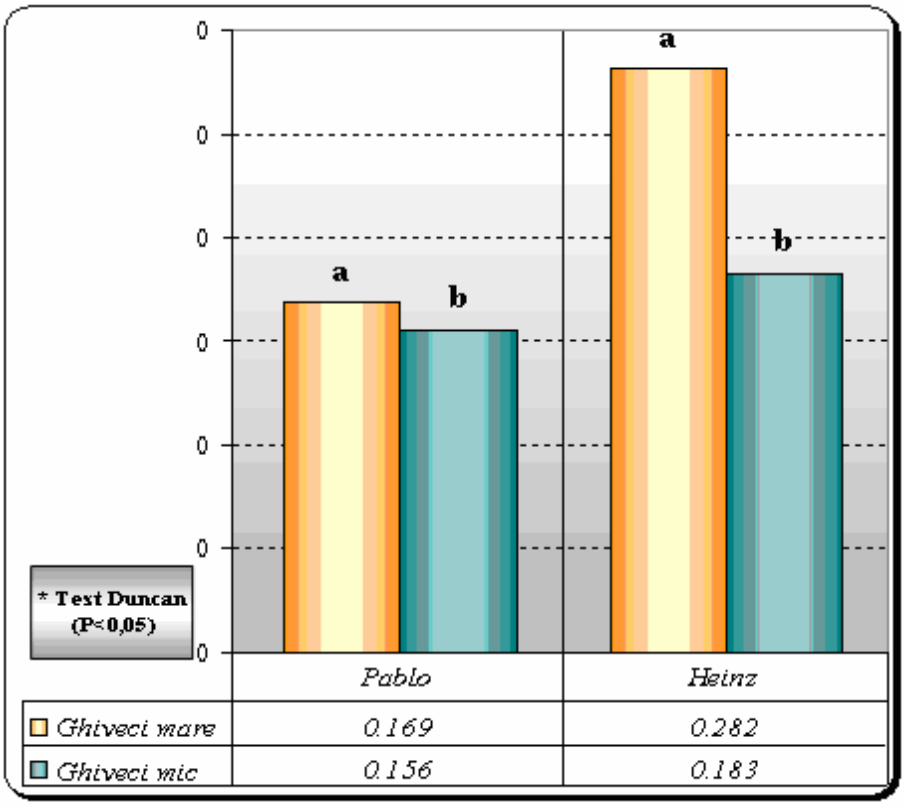

Fig. 6. Respiration intensity of soil (cm^3 CO_2/g s.u./h)

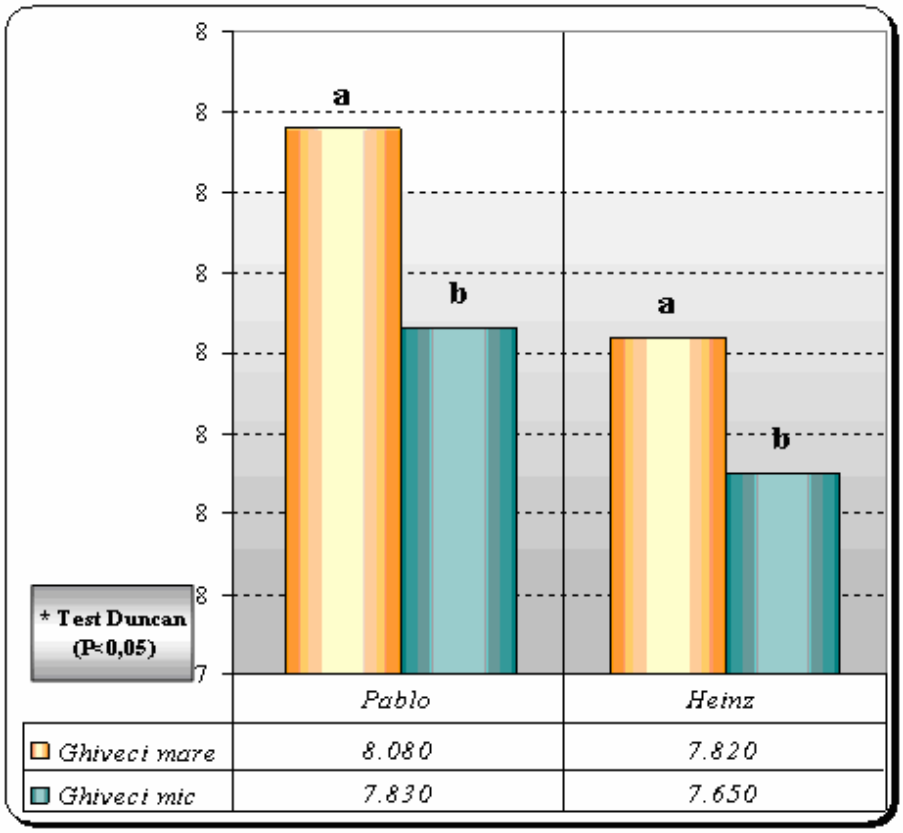

Fig. 7. Determination of soil pH

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NEW VARIETIES OF VEGETABLES FOUNDED AT S.C. UNISEM S.A.

GLĂMAN Gh.
SC UNISEM SA

S.C. UNISEM S.A. is aware that the variety has a contribution of about 40 % to the achievement of vegetables production and the varieties and the hybrids entered into the Official Catalogue of Plants Crop Varieties of Romania, but at some species of vegetables are not cultivers to fully satisfy the requirements of the farmers, consumers and industry, so UNISEM SA has started, since 1994, improvement works in some of his branches, aiming to get his own varieties.

Taking into account the results, S.C. UNISEM S.A. sets up in 1996 the **first private Laboratory of vegetable gardening researches in Romania.**

The established targets in the research activity are: comparative crops, crops for competition, improvement and conservative selection.

Within 1996-2007, the research activity took place in 8 branches: Alba, Bihor, Dolj, Ialomiţa, Ilfov, Neamţ, Sibiu and Tulcea with 27 persons, from which 9 doctors in agricultural sciences.

For the targets getting, especially those of the improvement and conservative selection, S.C. UNISEM S.A. took part in 18 research contracts together with vegetables stations and Horticultural Faculty; other 4 projects are going on.

As result of the activity made, during this period there were carried out:

- comparative crops : 34
- competition crops : 23
- new varieties : 17 at 15 vegetables species (the first varieties registered : **Scânteia 1** - garden bean, and **Ialomiţa 1** - garden pea, in year 2001)

The registered varieties at the State Institute for Testing and Varieties Registration (I.S.T.I.S) during 2000 – 2007 are: thyme **Favorit**, pumpkin and ornamental pumpkin **De Bihor**, kohlrabi type Patison **Steluţa**, garden bean **Scânteia 1**, kohlrabi **Siba**, lovage **Snagov**, garden pea **Ialomiţa 1** and **Tulceana**, dill **Siliştea**, carrot **Mileniu 3**, egg plants **Niculina**, leaf parsley **Danubiu**, melons **Dunărea** and **Roxana**, reed beet **Regat**, spinach **Select**, tomatoes **Ştefania**.

S.C. UNISEM S.A. is maintaining 32 vegetables varieties, from which 17 are his own varieties and 15 are in co-operation with vegetables stations or vegetables Departments.

In this material we are presenting 5 vegetables varieties, created by S.C. UNISEM S.A:

1. DE BIHOR Pumpkin and ornamental pumpkin

The variety was registered at I.S.T.I.S in 2006 and it was achieved at the branch Bihor.

It is semi-early variety with vegetation period of 140-145 days.

The growing type of the plant is creeper.

The fruit is small with length short and small diameter. The shape in longitudinal section is turban.

The shape of peduncle zone and pistil point is a depression. The fruit has grooves and the distance between them is big. The fruit has two main colors: dark orange and light cream colored. The secondary skin color is light yellow marbled distributed. The aspect of the fruit surface is coarse and it has warts.

The thickness of the kernel is medium, but the main color is light orange to medium.

The medium weight of fruit is 0,8-1,5 kgs

The variety is resistant at *Sphaerotheea fuliginea*, *Colletotrichum lagenarium*, *Pseudoperonospora cubensis* and *Cladosporium cucumerinum* and has tolerance at *Alternaria cucumerina* and *Sphaetotheca fuliginea*.

The production capacity of the variety is 35-40 tons/ ha.

The fruit having a stellar shape can be used as ornament, but also as food baked or preserved.

2. SIBA Kohlrabi

The variety was registered at I.S.T.I.S. in 2005 and it was achieved at the branch Sibiu.

It is semi-early variety with vegetation period of 80-85 days.

The antocianic color of cotyledons in plantlet phase is of medium intensity.

The length of petiole is short, the thickness is thin. The length of leaf limb is medium, the width is medium and the standing is semi-erect. The shape of tip limb is sharpened and the incisions up to the main nervure in the inferior part of leaf are medium. The incisions number of the limb edge is medium. The depth of the incisions of the limb edge is deep. The shape of limb in the cross section is concave.

The blistering limb is medium. The color is green-blue and the intensity is dark. The number of internal leaves in kohlrabi is small.

The color of the kohlrabi skin is violet-blue. The kohlrabi shape in longitudinal section is wide elliptic transversal and the tip shape is convex.

The kohlrabi size is medium 250-300 gr.

The variety has a tolarance at *Peronospora brassicae* (mildew), *Sclerotinia sclerotiorum* (white rot), *Xanthomonas campestris* (black nervures leaves) and *Erwinia carotovora* (wet rot).

The production capacity of the variety is 20-25 tons/ ha.

3. TULCEANA Garden pea

The variety was registered at I.S.T.I.S. in 2005 and it was achieved at the branch Tulcea.

It is a late variety with vegetation period 75-80 days.

The plant has a vigorous growing, with stalk length after flowering of 55-60 cm, with 16-18 nodes, the first fertile node being that of 14-15, respective at 18-25 cm high from the soil.

The maximum number of pods at node is three.

The pod is 8-9 cm length with pointless tip, the curvature is absent or very small and the curvature type is convex. The pod color is green-blue with light intensity.

The grains number in pod is 9-10, with medium size at the technical maturity - round and green color.

The technical maturity of the pods is simultaneously 75-80% enabling the mechanized harvesting. The period of over maturity of green grains is small (3-4 days), so that is needed a good organization of harvesting and hulling of the green pods within 4 days.

The variety is resistant at *Peronospora pisi* (mildew), *Ascochyta pisi, Fusarium o.sp. pisi* and has tolerance at *Uromyces pisi* and *Erysiphe pisi*.

The production capacity is 11-12 tons /ha green pods, efficiency of green grains 55-60%. The green grains are of quality extra-fine and fine in a percentage of 80-85 %.

4. DUNĂREA Melon

The variety was registered at I.S.T.I.S. in 2005 and it was achieved at the branch Tulcea.

It is a semi-late variety with vegetation period 75-80 days.

The base color of fruit skin before the maturity is green, yellow tint with light intensity to medium. The fruit length is big and diameter is small.

The ratio between the length and the diameter is big. The position of the maximum width at fruit is at the center. The fruit shape in longitudinal section is oval elliptic. The base color of the fruit at the consumption maturity is yellow with light intensity to medium. The fruit has flecks on the skin and their density is medium.

The peduncle length of the fruit is short and the thick is medium. The peduncle taking off is medium. The base shape of the fruit is sharpened and the shape of apex is sharpened to round off.

The size scar point of the pistil is big.

The fruit has ditches on the surface and the maximum width between them is medium. The ditches width is big and their depth is very small.

The reticular aspect of the fruit surface is medium to depth. The suberised coat is present and the thick is medium and the model is like a dense network.

The ditches color is green and yellow with medium intensity.

The pulp tick in transversal section in the middle zone of the fruit is medium and the shell is thick.

The base color of the fruit pulp is orange with medium intensity to dark.

The exterior pulp color is orange.

The variety is resistant at *Sphaerotheea fuliginea, Fusarium oxysporum, Colletotrichum lagenarium, Alternaria cucumerina, Pseudoperonospora cubensis.*

The average weight of the fruit is 1,5 –2,0 kg.

The production capacity is 50-35 tons/ha.

5. DANUBIU Leaf parsley

The variety was registered at I.S.T.I.S. in 2007 and it was achieved at the branch Ilfov.

The plant is medium high and large width. The density of the leaflet is medium.

The number of leaves on the plant is big. The leaves position is erect and semi-erect.

The leaf limb has lobe portion with atop position, medium intensity.

The limb length is medium and the width is narrow to medium. The limb sizes are medium.

The limb color is green with medium intensity. The leaflet shape is narrowing triangular to triangular.

The incision depth of the leaflet lobes is medium. The sinuses number on the edge of the leaflet is big.

The petiole is long and the thick is big. The antocianic color of the petiole is absent or very small.

The variety is resistant at *Erysiphe umbelliferarum* and *Septoria petroselini*.

The production capacity of the variety is 5,0 –6,0 tons / ha.

During 2007-2008 S.C. UNISEM S.A. are going to homologate at I.S.T.I.S a number of 7 lines of vegetables species from which : 2 long peppers, 1 sweet peppers, 1 summer cucumbers, 1 plant onion, 1 baking pumpkin and 1 white bush.

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THE EFFECT OF THE SALINE WATER IRRIGATION ON THE YIELD COMPONENTS OF TOMATOES *LYCOPERSICUM ESCULENTUM*

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Keyword: *lycopersicum esculentum*, Yield components, saline water

ABSTRACT

This study aims at investigating the effect of the saline water on the yield components of tomato *lycopersicum esculentum* Cindel F_1. This variety was planted in glace house and was irrigated with waters of different quality, corresponding to V_0 0.317ms/cm, V_1 1.5ms/cm, V_2 2.5ms/cm, V_3 4ms/cm.
The yield components studied were: number of fruit per plant, weight of the fruit and yield
We observed that the tomato plants resisted to a concentration of 1.5ds/m but in the case of higher concentration the plants were affected.
The yield of the tomato was affected by the salinity of the soil and we had a loss of about 24%.
The number of the fruit per plant was also affected we had a higher number of fruit in the case of the control but we had a weight and a volume less than the control.

INTRODUCTION

Soil salinity is a measure of the total amount of soluble salt in soil. As salinity levels increase, plants extract water less easily from soil, aggravating water stress conditions. High soil salinity can also cause nutrient imbalances, result in the accumulation of elements toxic to plants, and reduce water infiltration if the level of one salt element--sodium--is high. In many areas, soil salinity is the factor limiting plant growth.

Salinity tolerance is influenced by many plant, soil, and environmental factors and their interrelationships. Generally, fruits, vegetables, and ornamentals are more salt sensitive than forage or field crops. In addition, certain varieties, cultivars, or rootstalks may tolerate higher salt levels than others. Plants are more sensitive to high salinity during seedling stages, immediately after transplanting, and when subject to other (e.g., disease, insect, nutrient) stresses.

Climate and irrigation also influence salinity tolerance. As soil dries, salts become concentrated in the soil solution, increasing salt stress. Therefore, salt problems are more severe under hot, dry conditions than under cool, humid conditions. Increasing irrigation frequency and applying water in excess of plant demand may be required during hot, dry periods to minimize salinity stress.

MATERIALS AND METHODES

The experiment has been carried out in 2007, in the glass house of the department of Horticulture in the University of Agronomical Science and veterinary medicine Bucharest, and has the following objectives:

Study of the behavior of the yield components of tomato crop (*Lycopersicum esculentum*), irrigated with saline water,

The variety of the seedling of tomato used in this study is *Cindel F1*, and had been cultivated in vases soil 70/35, with the density of 4 plants per square meter.

In this experiment we used 4 variants:

- V_0- Control irrigated with fresh water 0.37 ms/cm (Control)
- V_1- Plant irrigated with saline water 1.5 ms/cm
- V_2- Plant irrigated with saline water 2.5 ms/cm
- V_3- Plant irrigated with saline water 4 ms/cm

Each variant had four repetitions

The determination of the yield components number of fruit per plant, weight of the fruit and yield in t/ha.

RESULTS AND DISCUSSIONS

We made the following determination regarding the yield components of the tomatoes:

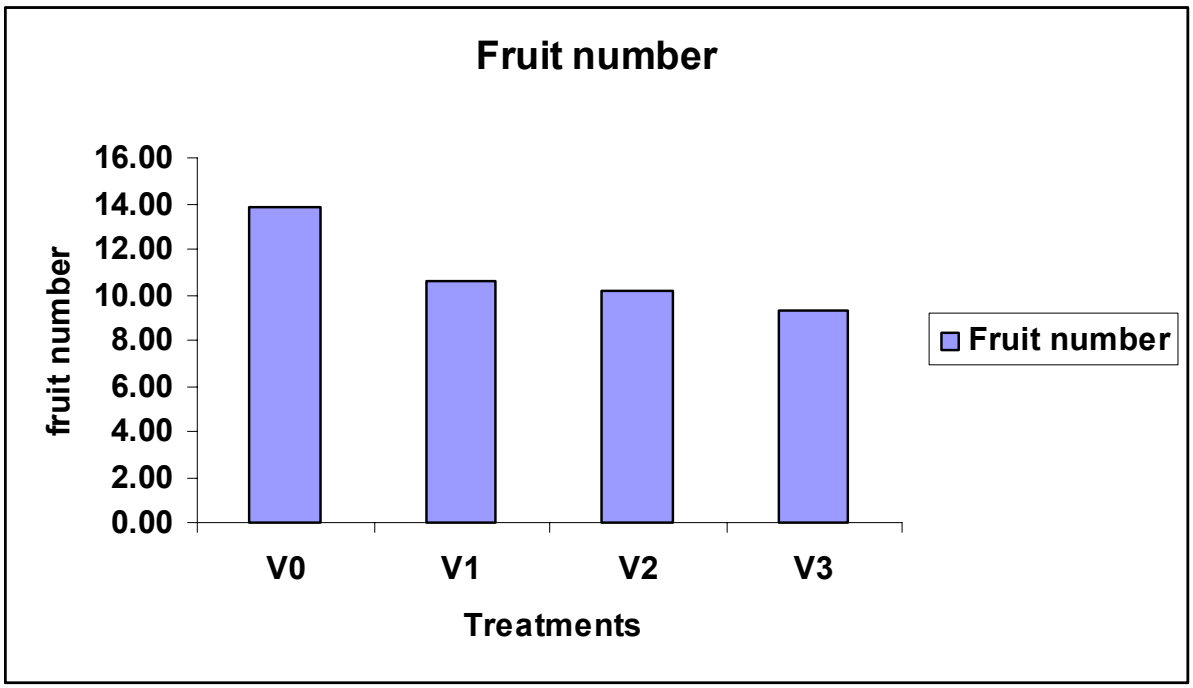

Fig. 1. Fruit number

The figure 1 shows that the number of the fruit decrease with the increasing of the concentration in the soil. We can see that in the control we had 14 fruits per plant and in the treatment irrigated with water that contains 4 ms/cm we had 9 fruit. We assist to a decreasing of 28.57%. Regarding V1 and V2 we didn't find a higher difference almost
10 fruit per plant.

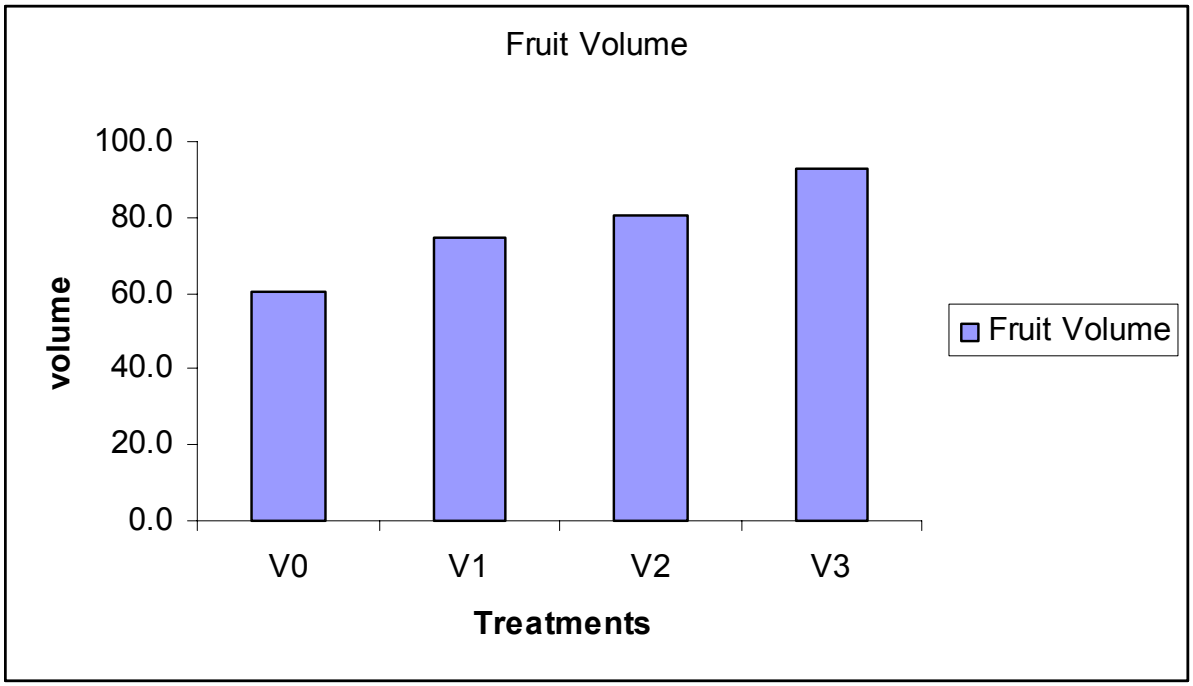

Fig. 2. The fruit volume

The figure 2 shows that the fruit volume increased with the increasing of the salt concentration. For the control we had an average fruit volume of 60 and for the treatment irrigated with water that contains 4 ms/cm 90.we had an increasing of 33.33%. for V1 the fruit volume increased with 14.28 % and for V2 we had 24.05 %.

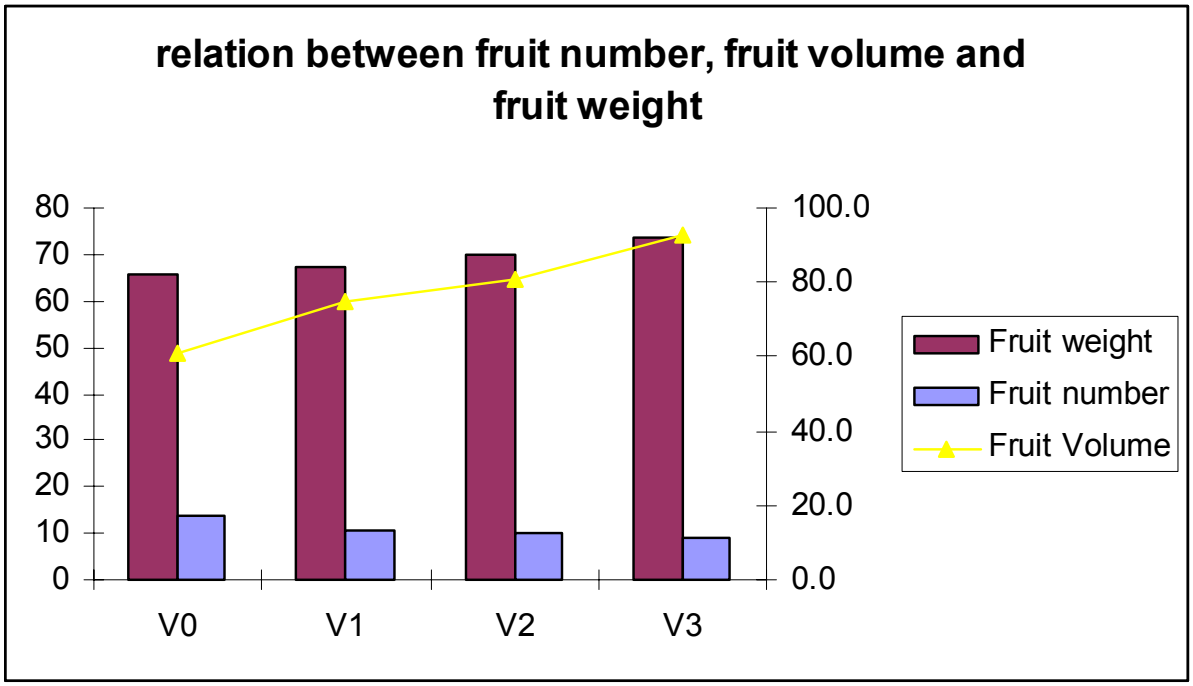

Fig. 3. The relation between the fruit number, fruit volume and the fruit weight

The figure 3 shows that there is an inverse proportional relation between the fruit number form one and the fruit volume and the fruit weight from other hand, meaning that when we have an increasing of the fruit number per plant, the fruit volume and the fruit weight decreased.

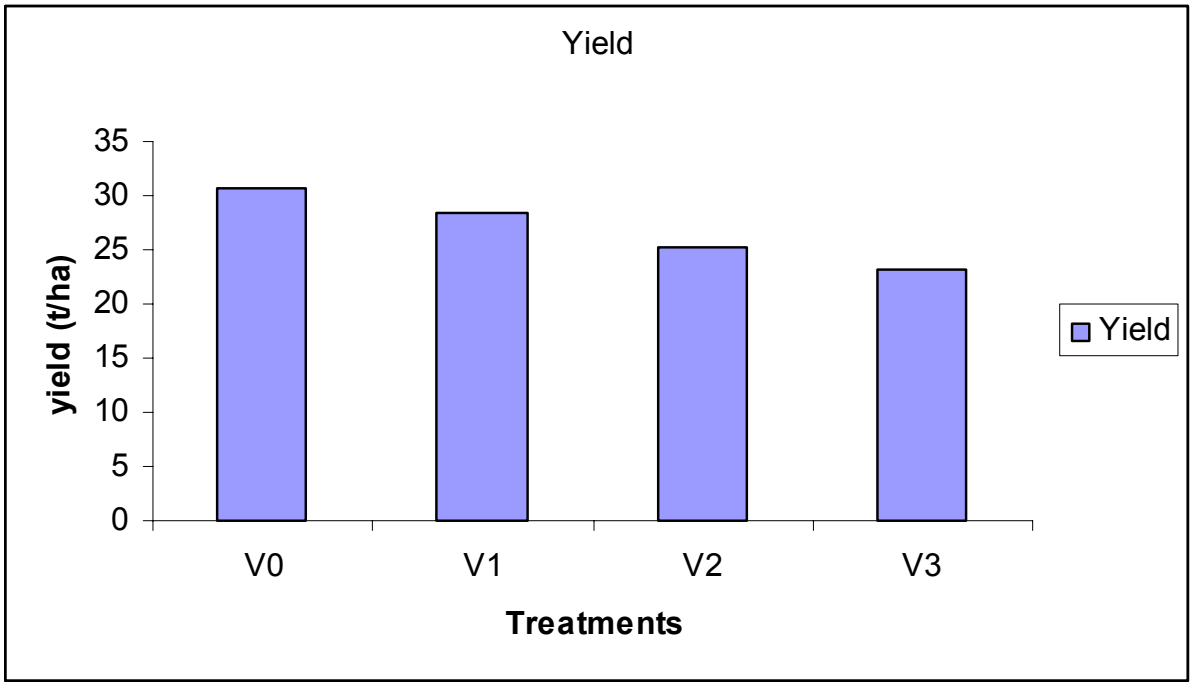

Fig. 4. The yield of the tomatoes in t/ha

The figure 4 shows that the yield decrease with the increasing of the increasing of soil salinity for the control we had 30.7 t/ha and for the treatment irrigated with 4 ms/cm we had 23.2 t/ha. The yield decreases almost 24.4%. This matches the study made (Amcher Jan kotuby *et al.,* 1999) that for ECe of 5 dS/m we assist to an decreasing of the tomato fruit about 25%.

CONCLUSIONS

The conclusions that we can take from this study are the following:

1. The number of the fruit decrease about 28.57% with the increasing of the concentration in the soil. V1 and V2 we didn't have a difference.
2. the fruit volume increased with the increasing (33.33%)of the salt concentration
3. we assist for an relation inverse proportional between the fruit number from one hand and the volume and the fruit weight form other we had a decreasing of the yield (24.4 %) with the increasing of the soil salinity.

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Lucrări ştiinţifice U.S.A.M.V.B., Seria B, Vol. L, 2007

THE EFFECT OF THE SALINE WATER IRRIGATION ON THE DEVELOPMENT OF RADISH *RAPHANUS SATIVUS*

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Keyword: *Raphanus sativus*, development, saline water

ABSTRACT

This study aims at investigating the effect of the saline water on the development of the radish *Raphanus sativus* Variety Sora. This variety was planted in glace house and was irrigated with waters of different quality, corresponding to V_1 0.317ms/cm, V_2 1.5ms/cm, V_3 2.5ms/cm, V_4 4ms/cm.
Some phenotypic observations were taken: roots weight, leaf number, root volume, fruit diameter.
The root weight was affected by the salinity and we assisted to a loss of 18.21% between the control and V_4.
The leaf number decreased with 23% between the control and V_4
The root volume was directly affected by the salinity and we assist to a decreasing of about 24.6 %.

INTRODUCTION

The total quantity of water on the globe represent 1.4 milliard of km^3 which the majority (97.5%) of this amount is saline water. Other 1.73% is blocked as glacial in the north and the south poles. And good quality water represents 0.3%.

The use of the saline water in agriculture for irrigation become indispensable in all the arid and semi-arid zones (Hamdy A.,1998), 357.5 millions in Australia, 319.3 millions in Asia, 146.9 millions in America, 80.5 millions in Africa, 50.8 millions in Europe.

In the Mediterranean area, nearly 200000 ha are under off-season protected cultivation. The tomato is a major protected crop (Hamdy and Lacirignola. 1993).

Under protected agriculture, the risk of soil salinization is relatively high as salt can accumulate at a higher rate in short period, than under outdoor conditions.

Salinity is the major reason for low yield and the quality deficiency of the radish (Mizrahi etal., 1988; Sonneveld and Welles, 1988; Mitchell et al., 1991; Mougou et al. 1993).

The use of bad quality water, saline water, require to: make a tolerant variety for salinity, amelioration of the water management, adoption of advanced irrigation technologies and maintenance of the chemical and physical properties of the soil.

MATERIALS AND METHODS

The experiment has been carried out in 2007, in the glass house of the department of Horticulture in the University of Agronomical Science and veterinary medicine Bucharest, and has the following objectives:

Study of the behavior of the Leaf number and the volume and the weight of the radish root (*Raphanus sativus*), irrigated with saline water,

The variety of the seedling of radish used in this study is *Sora*, and had been cultivated in vases soil 20/4.

In this experiment we used 4 variants:

- V_0- Control irrigated with fresh water 0.37 ms/cm (Control)
- V_1- Plant irrigated with saline water 1.5 ms/cm
- V_2- Plant irrigated with saline water 2.5 ms/cm
- V_3- Plant irrigated with saline water 4 ms/cm

Each variant had four repetitions

The determination of the yield components root weigth, root volume and leaf number.

RESULTS AND DISCUSSIONS

We made the following determination regarding of the root weight and root volume and the leaf number.

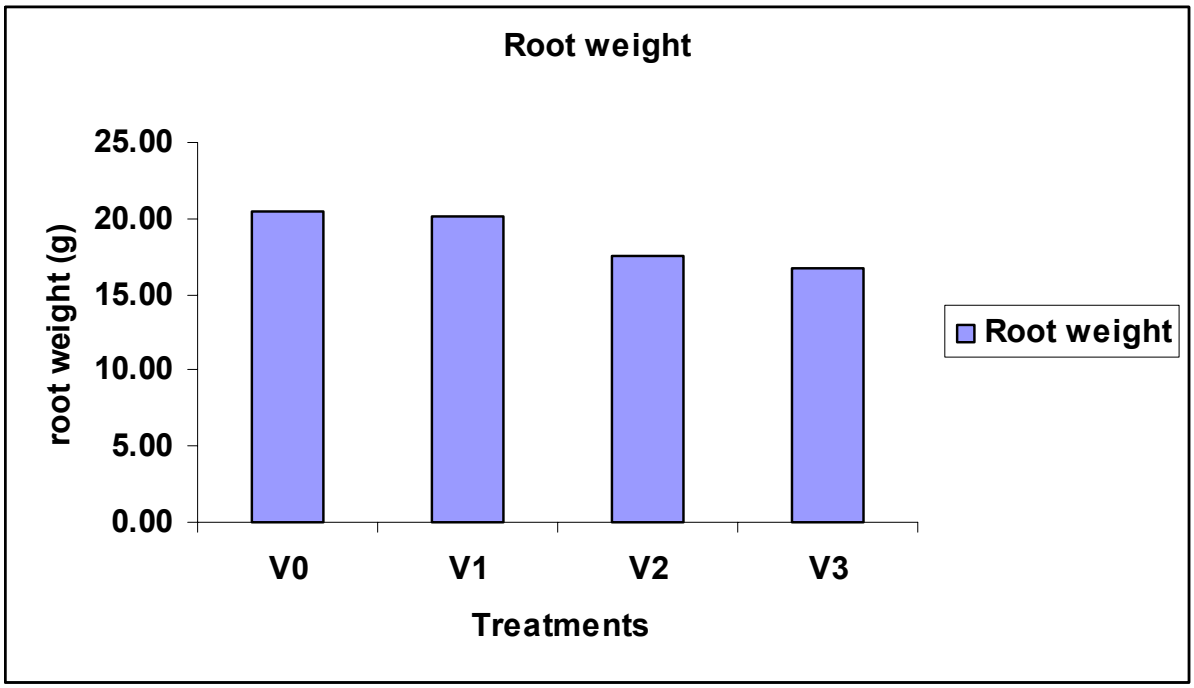

Fig. 1. The root weight

The figure 1 shows that the root weight decreased with the increasing of the soil salinity. We had an average root weight for the control of about 20.5 g and for the treatment irrigate with saline water that contain 4 ms/cm 16.77 g. we have a decreasing of 18.19 %. For the treatment irrigated with 1.5 ms/cm we didn't find a difference. The effect of the salinity begins from the treatment irrigated with 2.5 ms/cm.

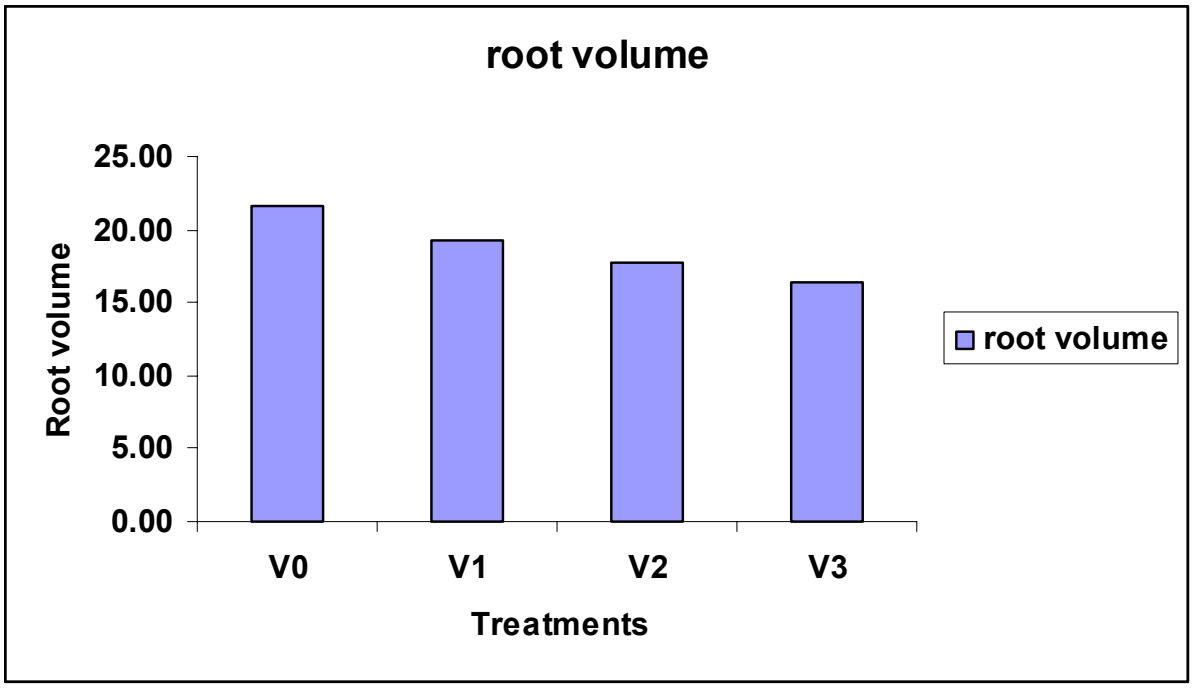

Fig. 2. The root volume

The figure 2 shows that the root volume also decreases with the increasing of the soil salinity. We had an average value for the control of 21.67 and for the treatment irrigated with saline water that contains 4ms/cm 16.33. We assist to a decreasing 24.64%. We can conclude that we have a systematic decreasing for all the treatments with the increasing of soil salinity.

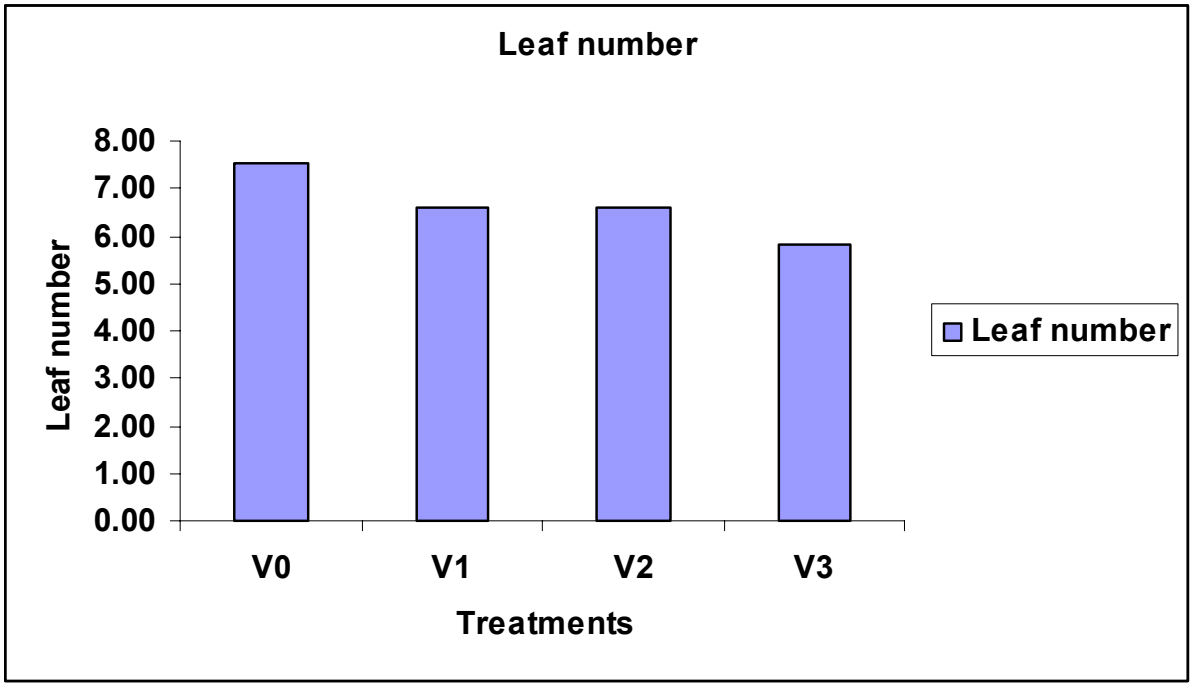

Fig. 3. The leaf number

The figure 3 shows that the leaf number decreases with the increasing of the soil salinity. We have an average leaf number of 7.53 in the case of the control and for the treatment irrigated with 4 ms/cm we had 5.8 leaves. We assist to a decreasing of the leaf

number for about 23%. For the other treatment irrigated with water that contains respectively 1.5 and 2.5 ms/cm we didn't find a difference.

CONCLUSIONS

The conclusions that we can take from the present study are the following:

1. The average root weight decreased with the increasing of the soil salinity. The roots irrigated with saline water of 4 ms/cm lost 18.2% of their weight.
2. The root volume also decreases with the increasing of the soil salinity. The difference between the control and V3 was 24.64%.
3. The leaf number shows a decreasing of about 23% between the control and the treatment irrigated with saline water that contains 4 ms/cm

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VERTICALLY DEVELOPED GREENHOUSE

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Summary: *In this paper writing the authors intend to present part of their activity's results within the framework of the „CEEX" no. 43/03.10.2005 Project – "Integrated management of production, conditioning, and marketing of vegetables seeds, according to European norms and standards". This includes presenting conclusive results obtained up to this moment, referring to building a vertically developed greenhouse experimental model, destined for the production of vegetable and flower transplants, for drying up seeds and for the first results obtained as a consequence of its being put into operation.*

Key words: *vertically developed greenhouse, transplants production, seeds drying, seed production vegetables.*

1. INTRODUCTION

At present, the general objectives of Romanian vegetable growing mainly aim at adapting itself technologically and species, to the new conditions of the European and global market and promoting there the reconstruction and reform in the rural area, in the context of tacking over and implementing the communitarian Acquis. Raising the technological and qualitative level of the vegetable production is conditioned by the realization of an entire chain of technological links: providing seeds with quality indices corresponding to the level of the European Standard, suitable superior genotypes for the different agricultural areas of our country, the integrated management of plant, environment and consumer protection, diversifying the range of cultivated species, the rational administration of the land (rotation/alternation of crops, the set of agro-technical measures for restoring and improving the physical, chemical and especially the microbiological proprieties of the soil), rational fertilizing as well as introducing new technologies, innovating horticulture in general, but especially for vegetable growing as the vertically developed greenhouse **(Fig1)**.

Figure 1. Assembly view

The vertically developed greenhouse represents a premiere in the domain of protected areas used in horticulture. The technical problem this installation intended to solve is realizing a greenhouse, which using the same area at soil level could assure an increased surface of germinative beds for plants and offering superior conditions for rendering valuable the light and heat factors designed for producing vegetable and flower transplants, flower production and drying vegetable and flower seeds. The experimental model was realized in the S.C.D.L. Buzau, Mechanization Laboratory, and is located near the seed complex and the horizontal greenhouse, with access to the water, gas, electric power source and to the sewerage system **(Figure 2, 3)**.

Figure 2. Growing transplants

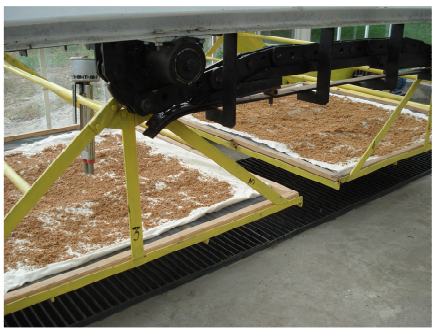

Figure 3. Drying seeds

The technical characteristics of the experimental model of the vertically developed greenhouse are: total height: 7350 mm; the surface of the precincts with buckets: 7,7 mp; number of buckets: 10; the dimensions of a bucket: 1650 mm x 1575 mm; the surface of a bucket: 2,6 mp; the buckets' surface: 26 mp; multiplying account of the surface occupied at soil level: 3,37; the length of the conveyer belt: 17500 mm; the distance between the buckets: 1750 mm; the belts number of wheels - eight; the diameter of the belt's wheel: 300 mm; the divisor diameter of the belt's wheel: 250 mm; number of cogs of the belt wheel - six; number of links of the conveyer belt: 140; total number of links: 280.

The experimental model of the vertically greenhouse is made up of the following parts:

THE FRAME OF THE GREENHOUSE: has as basis a metallic skeleton made of four steel tube pillars with 116 mm diameter embedded in concrete at 1.5 m depth. The four pillars are joined together in the upper part by two steel cross pieces profile I with 180 x 80 dimension, which sustain the conveyer belts and two beams made of rectangular tube 80 x 80 x 6 for rigidity, and in the lower part there are also two cross pieces and two beams. On the four sides the pillars are joined together by the frames in which the window panes are to be mounted. The working space of the greenhouse is also part of the frame and it is built of four tube pillars joined together and the precincts with buckets through the roof made of corner iron and of profile T steel of 30 mm.

THE SUPPORT GROUP made of: the cross pieces of steel profile I with 180 x 80 dimensions are soldered on the precincts pillars and are fastened to the side part of the greenhouse through some wide steel segments, to be rendered rigid; the special belt wheels, eight as numbers are made of 18 mm thick plate, the exterior diameter is 300 mm, the divisor diameter circle measures 250 mm, the cog number of wheel is six, and the distance between two cogs is of 30mm, the belt wheels are mounted on the cross pieces of the greenhouse with some bearings by some axes.

THE DRIVING GEAR GROUP, situated in the inferior part of the installation is form of:

An electronic revolution speed variating device: an electric engine with three stages and 2.2 kw power; a worm speed reducing gear and a worm wheel; a belt drive between the worm speed reducing gear, the worm wheel and an intermediary axle with two belt wheels; two belt drives between the intermediary axle and two special belt wheels on which two belt wheels are attached.

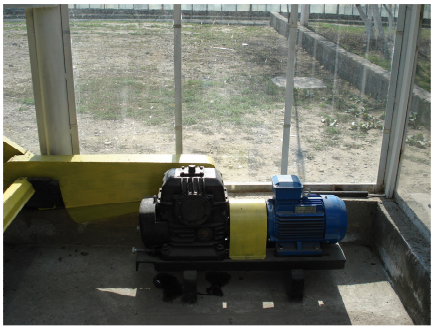

Figure 4
The driving gear group

Figure 5
Transmission

THE BUCKET CONVEYER is formed of two conveyer belts, placed on the two sides of the greenhouse, mounted on eight special belt wheels which support eight bearings by eight axles. The conveyer belts are identical with usual conveyer belts, are made of cover plates mounted in pairs forming links joined together by riveted axles on which the bushings are mounted. The cover plates were built out of 60 mm wide and 8 mm thick steel, every cover plate has 180 mm length, every cover plate has two holes of 20 mm, with 125 mm distance between centers. The axles have a 20 mm diameter, the same with the interior diameter of bushings, whose exterior diameter measures 30 mm. The conveyer belts have 17500 mm length each, meaning 140 links. On the two conveyer belts ten buckets are mounted, the distance between them measuring 1750 mm, or 14 links. The buckets are made of steel: the basis is rectangular shaped, made of 30 mm corner iron with 1650 x 1575 dimensions and the support bars are triangular shaped made of 60 x 8 band iron and a central bar also made of band iron. A joining together device is formed of a bushing, with the interior diameter equal with the diameter of the belt's arch, upon which two triangular shaped pieces of band iron are mounted, with an angle of the same measure with that between the buckets' support-bars. The role of the joining together devices is to allow the dismounting of the buckets. At every fourteen links these are joined together by a special screw which connects the conveyer belt to the bucket.

THE STRETCHING DEVICES are mounted both on the superior side of the installation and on the inferior one on the cross pieces. A stretching device is formed of a tire whose length covers the distance between the two belt wheels, which is curved at both ends in order not to prevent the belt from rolling.

THE CLIMATIZATION SYSTEM is made of: the windows situated in the inferior part of the greenhouse together with the hinges in the superior part; the roof of the greenhouse whose panels joined together on the ridge through hinges can be raised with help of some beams fixed in the inferior part of the roof upon which two levers are mounted with joints at both ends, and to these ones two longerons are added, guided by bushings vertically set into action by two winches set on a beam in the inferior part of the greenhouse; the hot air generators being supplied with 6000 mc / hour flow capacity gas. During the greenhouse's functioning, the hot air generator, supplied with gas, was replaced with the electric forced convection air heater with 4 kw power, to determine the energy consume. The hot air generator is mounted in a tank built under the bucket conveyer **(Figure 6, 7).**

Figure 6 The tank under the bucket conveyer

Figure 7
The roof of the greenhouse with panels joined together

Description of the way the greenhouse works: the electric engine is supplied with electric energy through an electronic revolution speed variating device that can assure at the exit from the electric engine between 0 – 1000 revolutions per minute, the movement being transmitted through a worm speed reducing gear, worm wheel and two belt drivers to the two conveyer belts. The optimum movement speed of the bucket conveyer was appreciated at a value of 10 mm/sec. The bucket conveyer made of the conveyer belts upon which the bucket are mounted is set into slow ascending-descending movement by the electric engine through the installation drive, successively exposing the biological material to different solar light intensities and as much as possible to a constant temperature. The biological material sown in the alveoli blades has been placed in glass fiber trays made at the proper dimensions in order to fit in the buckets, equipped with devices that fasten them to the buckets and with a drain for the excess of the accumulated water. For drying the vegetable and flower seeds on every one of the conveyer buckets a supplementary frame is mounted to double the quantity of seeds which undergoes the drying process. The optimum microclimate inside the installation was assured with the help of the AIRFARM-6000 forced convection air heater, or with the 4 kw power electric forced convection air heater, which have the possibility of producing both hot air at different temperatures and to supply the precincts with air at atmospheric temperature and humidity mounted in a hole under soil level,. The greenhouse has windows in the inferior part and the roof is made of two panels mounted with hinges on the ridge which can be raised in any position with the help of two winches, which favors the formation of a ascending current favorable to controlling the humidity and the temperature inside the installation.

2. OBTAINED RESULTS

2.1. Energy determinations

- Power consume for moving the bucket conveyer – 40 w / hour;
- Power consume for heating was reduced with 45% compared to a compartment with the same surface of the horizontal greenhouse.

2.2. Observations regarding the functioning of the greenhouse

- The bucket conveyer hasn't presented any serious damage;
- The dimensions between the belt's wheels have been corrected, because initially in certain positions the buckets would block;
- The dimension of the buckets between the conveyer belts has been modified to prevent their being blocked by contact;
- The stretching devices of the conveyer belts have been modified to allow a shock free movement of the buckets;
- The stretching devices of the conveyer belts have been modified to assure a silent movement of the bucket conveyer.

2.3. Observations regarding plant growth in the vertically developed greenhouse

- Using the vertically developed greenhouse for vegetable and flower transplants production, the time of obtaining them is reduced with 20%;
- During the days with powerful insolation the temperature in the vertically developed greenhouse have been with 10 -15 ^{o}C lower than the temperature inside the horizontal greenhouse assuring a microclimate favorable to the growth and development of the plants;
- During the periods with low atmospheric temperature at all the levels of the vertically developed greenhouse were not present any differences, while in the case of the horizontal greenhouse there were differences of 5 – 10 ^{o}C between the areas situated next to the heat source and the more far away areas.

Figure 8 Flower transplants

2.4. Observations regarding seed drying in the vertically developed greenhouse

- The vertically developed greenhouse offers very good conditions for vegetable seed drying;
- Using the vertically developed greenhouse for drying up seeds from the Cucurbitaceous (studied case: squash), the exposure time is reduced with 71.45%;
- Reducing the exposure time means saving handwork – 40 hours / 100 kg dried seeds, meaning 1.75 lei / kg or 5.47%.

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Lucrări ştiinţifice U.S.A.M.V.B., Seria B, Vol. L, 2007

RESEARCH REGARDING CULTURE SYSTEMS TO BROCCOLI UTILISING DENSITIES AND DIFFERENT HYBRIDS

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Keywords: *Brassica oleracea convar. botrytis var. italica Plench*, culture systems, density, production, Chevalier, Milady, Belstar.

ABSTRACT

In the following paper, we are going to test the behaviour of some broccoli hybrids, in several methods of culture and the influence of four variants of density, in order to elaborate a technology of culture capable to obtain better results. The biological material was represented by the following hybrids: Chevalier, Milady and Belstar. The methods of culture were the following: solarium covered with polyethylene and open field for the early culture, shaded field with green net for the summer culture, and open field for the fall culture. There were used 4 densities: 57142 plants/ha, 79365 plants/ha, 40816 plants/ha, and the control variant 31746 plants/ha. The planting of the broccoli hybrids was made at four different dates: 15th March (solarium), 3rd April (field), 13th June (summer) and 20th July (autumn).

INTRODUCTION

In our country, the broccoli consumership has become larger and larger, gaining more and more popularity among the consumers. Because broccoli is a plant quite new in Romania, the researches regarding the cultivation of this vegetable are so few. If the conditions of the production of this plant are tested more and more, an adequate technology will be settled. The realised researches (Dobrin Elena, Ciofu Ruxandra, 2003) have proved that broccoli can be cultivated using several methods of culture.

MATERIAL AND METHOD

The research was made to the Department of Vegetable growing of Horticulture Faculty belonging to the University of Agronomic Sciences and Veterinary Medicine of Bucharest, in 2007.

It was organised a bifactorial experiment in subdivided lots with 3 repetitions. The A factor (the hybrid) was represented by the following hybrids: Chevalier, Milady and Belstar, while factor B (density) was represented by the following densities: 57142 plants/ha, 79365 plants/ha, 40816 plants/ha, and the control variant of 31746 plants/ha. Twelve experimental variants have resulted (Table 1), which were placed in four methods of culture: solarium covered with polyethylene and open field for the early crop, field shaded with green net for the summer culture, and open field for the fall culture. The biological material was represented by the following hybrids: Chevalier, Milady and Belstar. The broccoli cultures were set up using seedlings, made in the greenhouse. The planting was made at 23rd January (for the covered solarium), at 10th February (for the field), at 10th May (for the summer crop), and at 22nd June (for the fall crop).

The seedlings were pricked out in the phase of two real leaves in plastic pots at 7th February (for the solarium), 26th February (for the field), 21st May (for summer), 2nd July

(for fall). The planting of the hybrids at different distances was made at four dates: 15th March (solarium), 3rd April (field), 13th June (summer) and 20th July (fall).

During the vegetation period there were applied the following specific processes: filling up the empty spaces, two weedings, two fertilizations in different phases with Complex III, treatments against pest and crop irrigation. It must be mentioned that the summer crop needed additional processes: shading the plants with a green net in order to protect them against the solar radiation, frequent irrigations with a moderate rate, a big number of treatments and repeated weedings. During the test period, there were made observations for each variant regarding the plants height, the number of leaves, the stem diameter, the presence of secondary sprouts on the plant and their number, the presence of main and secondary inflorescences, the mean weight of the main and secondary inflorescences, the diameter, the height, the volume and the number of bouquets at the main inflorescences. The harvest of the inflorescences was made at the right time, exactly before the opening of the floral buttons. The inflorescences from the summer crop were harvested before reaching the maximum development because of the high temperatures, avoiding their degradation.

RESULTS AND DISCUSSIONS

1. Results regarding the length of the vegetation period in the four methods of culture at the tested hybrids

In the figure 2, it can be noticed that the number of days from emergence till planting differs from one method of culture to another because of the different conditions of light and temperature, being bigger at the early crop (46 and 48 days), and of 35 days at the summer crop, and 29 days at the fall crop. The period between the planting and the appearance of the main inflorescences is only a little bit different not only between the hybrids, but also between the methods of culture, tending to increase at the fall crop. The shortest period between the planting and the appearance of the main inflorescences appears at the Belstar hybrid (38 days), during the summer crop. Reaching maturity depends on the hybrid and the method of culture, so at the Chevalier hybrid are necessary 62 days (solarium), 68 days (field), 63 days (summer), and 69 days (autumn), at the Milady hybrid 62 days (solarium), 65 days (field), 60 days (summer), 73 days (autumn), and the Belstar hybrid 64 days (solarium), 69 days (field), 60 days (summer), 67 days (autumn).

2. Results regarding the usual production at the tested hybrids taking into consideration the planting density

The planting density has influenced not only the production obtained per surface, but also the production of each plant. At a density of 79365 plants/ha, there were obtained large productions not only in the case of the tested hybrids, but also in the four methods of culture. The Chevalier hybrid obtained at this density a mean main production of 31,349t/ha (solarium), 32,61t/ha (field), 31,746t/ha (summer) and 35,634t/ha (autumn). Also the hybrids Milady and Belstar (Table 1 and 2) have obtained the largest mean main productions at the density of 79365 plants/ha. Large mean main productions were also obtained at the density of 57142 plants/ha. Because of the small number of inflorescences harvested per surface, the control variant (31746 plants/ha) obtains the smallest mean main productions. So the Milady hybrid obtains at this density 20,158t/ha (solarium), 20,761t/ha (field), 20,317t/ha (summer), 20,412t/ha (autumn). The other hybrids have the same results at this density. There is a direct proportional rapport between the production and the planting density, but between the mean weight of the main inflorescences and the planting density the rapport is inverse proportional. The largest main inflorescences are obtained at the control variant (31746 plants/ha), thus at the Chevalier hybrid the mean weight is of 0,750 kg (solarium), 0,761 kg (field), 0,747 kg (summer), and 0,788 kg (autumn). This phenomenon appears at all the other hybrids. At big

density, the smallest inflorescences are obtained. Thus at the density of 79365 plants/ha the main inflorescences have at the Milady hybrid the mean weight of 0,350 kg (solarium), 0,367 kg (field), 0,355 kg (summer), 0,385 kg (autumn), in comparison with the control variant with 31746 plants/ha where the inflorescences reach 0,635 kg (solarium), 0,654 kg (field), 0,640 kg (summer), 0,643 kg (autumn). It hasn't been noticed a clear influence regarding the secondary production.

3. Results regarding the methods of culture

Between the methods of culture there are differences in the production (Table 1 and 2). The early broccoli culture in the solarium is superior to the field culture because of the early period and the level of productions. The Chevalier hybrid obtained in the solarium mean total productions of 30,174t/ha, the Milady hybrid 28,641t/ha, and the Belstar hybrid 28,706t/ha, while in the field there were obtained 29,317t/ha at Chevalier, 27,694t/ha at Milady and 27,515t/ha at Belstar.

In the summer crop, by shading the plants with a green net it was realised a miniprotection against solar radiation, thus obtaining favourable productions. The Chevalier hybrid obtained in this method of culture a mean total production of 28,762t/ha, and the Milady hybrid 27,30t/ha. During the summer crop, the Belstar hybrid has adapted better than the others at the high temperatures, obtaining the largest mean total production (29,248t/ha).

The largest productions at all hybrids were obtained in the autumn crop, when Chevalier obtained a mean total production of 33,073t/ha, Milady 28,585t/ha, and Belstar 29,304t/ha. The secondary production was larger at the plants cultivated in the solarium, being larger at Milady (4,139t/ha), and at Belstar and Chevalier of 3,702t/ha and respectively of 2,568t/ha. In the summer crop, Belstar has the best secondary production (2,86t/ha).

CONCLUSIONS

1. Knowing the number of days from planting till the appearance of the main inflorescences, one can establish the schedule with the harvest dates for each method of culture.
2. Using the four methods of culture (solarium, field, summer, autumn), the broccoli consumption can be provided from the first half of May till the end of Octobre.
3. Good results can be obtained in the summer crop only by using some nets or other materials for the protection of the broccoli plants.
4. The early broccoli crop in the solarium in comparison with the one from the field, has the advantage of the early period, the level of production, the high quality and of a more attractive price.
5. At all methods of culture at the hybrids tested, the largest mean main productions were obtained at a density of 79365plants/ha, while the main inflorescences had the smallest weight at the same density.
6. From all the tested hybrids, the largest mean total productions were obtained by Chevalier 30,17t/ha (solarium), 29,31t/ha (field), 33,07t/ha (autumn), while Belstar presented a high adaptability at high temperatures in the summer crop with a mean total production of 29,24t/ha and a secondary production of 2,86t/ha.
7. The largest mean total productions were obtained at the fall crop 30,32t/ha, followed by the solarium (29,17t/ha), summer crop (28,43t/ha), and the early field crop (28,17t/ha).
8. From an economic point of view, the broccoli cultivated in the solarium and that from the summer crops realizes substantial incomes.

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Tables

Table 1. Experimental variants

Culture systems	A factor	Variants	B factor		
	Hybrid		Distances (cm)	Nutrition space (cm^2)	Number of plants/ha
1. Early crop-SOLARIUM 2. Early crop-FIELD 3. Summer crop-FIELD-shaded with green net 4. Autumn crop-FIELD	Chevalier	V1	70/25	0,175	57142
		V2	70/18	0,126	79365
		V3	70/35	0,245	40816
		V4Mt	70/45	0,315	31746
	Milady	V5	70/25	0,175	57142
		V6	70/18	0,126	79365
		V7	70/35	0,245	40816
		V8Mt	70/45	0,315	31746
	Belstar	V9	70/25	0,175	57142
		V10	70/18	0,126	79365
		V11	70/35	0,245	40816
		V12Mt	70/45	0,315	31746

Table 2. Production indicators at broccoli, solarium and field crop

Variant	The mean weight of the main inflorescences (kg/plant)		The mean main production (t/ha)		The mean weight of the secondary inflorescences (kg/plant)		The mean secondary production (t/ha)		The mean total production (t/ha)	
	Solarium	**Field**	**Solarium**	**Field**	**Solarium**	**Field**	**Solarium**	**Field**	**Solarium**	**Field**
CHEVALIER										
V1	0,510	0,527	29,142	30,113	0,042	0,010	2,399	0,571	31,541	30,685
V2	0,395	0,411	31,349	32,619	0,046	0,013	3,650	1,031	34,999	33,650
V3	0,640	0,651	26,122	26,571	0,053	0,033	2,163	1,347	28,285	27,918
V4Mt	0,750	0,761	23,809	24,159	0,065	0,027	2,063	0,857	25,872	25,015
Mean	**0,573**	**0,587**	**27,605**	**28,365**	**0,051**	**0,020**	**2,568**	**0,951**	**30,174**	**29,317**
MILADY										
V5	0,462	0,480	26,399	27,428	0,070	0,038	3,999	2,171	30,398	29,599
V6	0,350	0,367	27,777	29,126	0,052	0,025	4,126	1,984	31,903	31,111
V7	0,580	0,598	23,673	24,408	0,090	0,050	3,673	2,040	27,346	26,448
V8Mt	0,635	0,654	20,158	20,761	0,150	0,09	4,761	2,857	24,919	23,618
Mean	**0,506**	**0,524**	**24,501**	**25,430**	**0,090**	**0,050**	**4,139**	**2,263**	**28,641**	**27,694**
BELSTAR										
V9	0,464	0,481	26,513	27,485	0,058	0,025	3,314	1,428	29,827	28,913
V10	0,361	0,379	28,650	30,079	0,040	0,015	3,174	1,190	31,824	31,269
V11	0,591	0,610	24,122	24,897	0,081	0,021	3,306	0,857	27,428	25,754
V12Mt	0,653	0,680	20,730	21,587	0,158	0,080	5,015	2,539	25,745	24,126
Mean	**0,517**	**0,537**	**25,003**	**26,012**	**0,084**	**0,035**	**3,702**	**0,849**	**28,706**	**27,515**

Table 3. Production indicators at broccoli, summer and autumn crop

Variant	The mean weight of the main inflorescences (kg/plant)		The mean main production (t/ha)		The mean weight of the secondary inflorescences (kg/plant)		The mean secondary production (t/ha)		The mean total production (t/ha)	
	Summer	**Autumn**	**Summer**	**Autumn**	**Summer**	**Autumn**	**Summer**	**Autumn**	**Summer**	**Autumn**
CHEVALIER										
V1	0,520	0,585	29,713	33,428	0,012	0,042	0,685	2,399	30,398	35,827
V2	0,400	0,449	31,746	35,634	0,015	0,052	1,190	4,126	32,936	39,760
V3	0,632	0,672	25,795	27,428	0,030	0,050	1,224	2,040	27,019	29,468
V4Mt	0,747	0,788	23,714	25,015	0,031	0,070	0,984	2,222	24,698	27,237
Mean	**0,547**	**0,623**	**27,742**	**30,376**	**0,022**	**0,053**	**1,020**	**2,696**	**28,762**	**33,073**
MILADY										
V5	0,465	0,506	26,571	28,913	0,041	0,056	2,342	3,199	28,913	32,112
V6	0,355	0,385	28,174	30,555	0,031	0,058	2,460	4,603	30,634	35,158
V7	0,581	0,530	23,714	21,632	0,060	0,068	2,448	2,775	26,162	24,407
V8Mt	0,640	0,643	20,317	20,412	0,010	0,071	3,174	2,253	23,491	22,665
Mean	**0,510**	**0,515**	**24,694**	**25,378**	**0,035**	**0,063**	**2,606**	**3,207**	**27,300**	**28,585**
BELSTAR										
V9	0,471	0,500	26,913	28,571	0,050	0,049	2,857	2,799	29,770	31,370
V10	0,390	0,391	30,952	31,031	0,035	0,038	2,777	3,015	33,729	34,046
V11	0,620	0,621	25,305	25,346	0,040	0,040	1,999	1,632	27,304	26,978
V12Mt	0,705	0,701	22,380	22,253	0,012	0,081	3,809	2,571	26,189	24,824
Mean	**0,546**	**0,553**	**26,387**	**26,800**	**0,034**	**0,052**	**2,860**	**2,504**	**29,248**	**29,304**

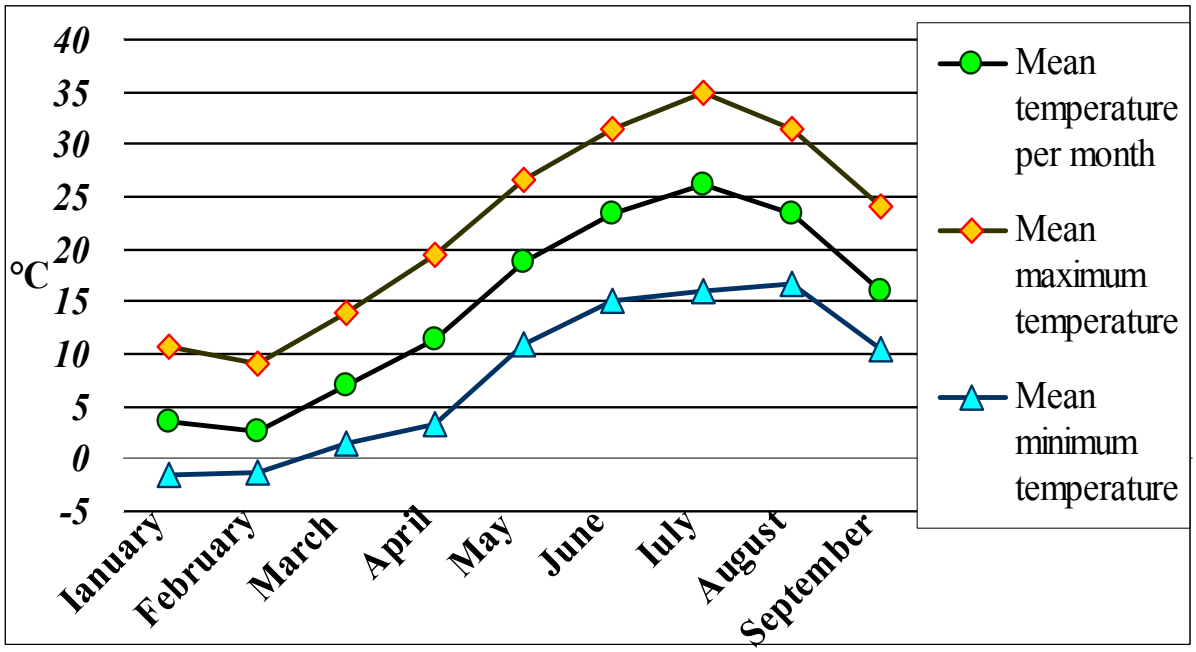

Fig. 1. The evolution of temperature during the experiment

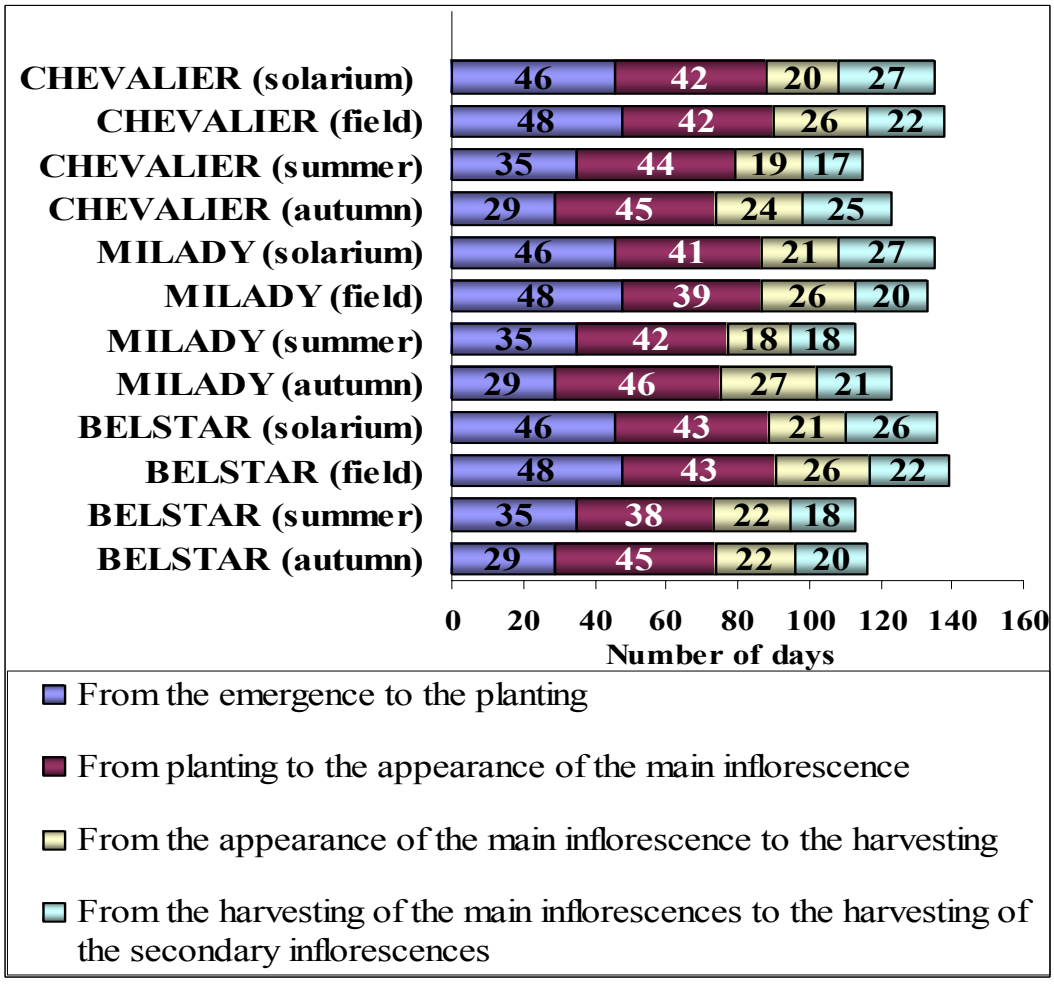

Fig. 2. The duration of the vegetation period at the hybrid used

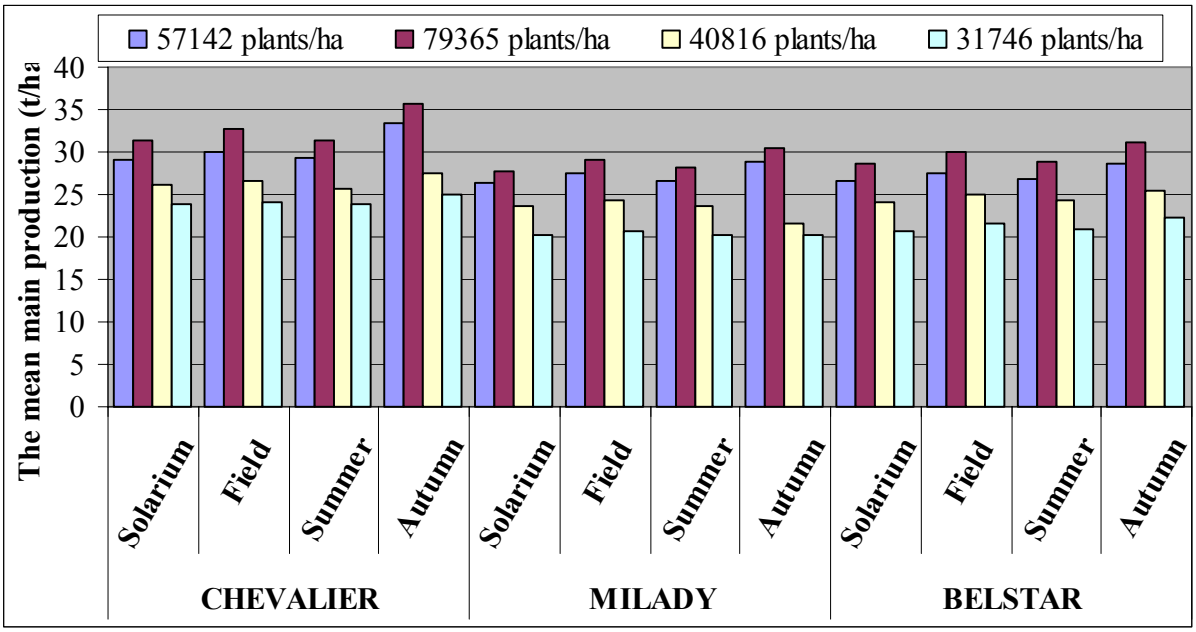

Fig. 3. The influence of the density at the early crop (solarium and field), summer crop and in the autumn crop on the mean main production

Fig. 4. View from the solarium crop

Fig. 5. View from the summer crop shaded with green nets

Fig. 6. View from the autumn crop

Fig. 7. Chevalier hybrid

Fig. 8. Milady hybrid

Fig. 9. Belstar hybrid

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ORNAMENTAL PLANTS & LANDSCAPE ARCHITECTURE

PRELIMINARY RESULTS REGARDING THE INTENSITY OF SOME PHYSIOLOGICAL PROCESSES AT *MURRAYA EXOTICA* L. AND *JASMINUM* SP

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Keywords: photosynthesis, transpiration, respiration, stomatal conductance

ABSTRACT

Physiological processes are in direct connection with the growing and blossoming of the flowers. The intensity of the photosynthesis, transpiration, respiration and the stomatal conductance is different for each plant and phenophase development. The experience was initiated to surprise the metabolic processes intensity of the *Murraya exotica* L. and *Jasminum* sp. correlated with the stage development and the culture substrate type. It was observed a link between the presence of the marc of grapes in the substrate and the intensity of the physiological processes.

INTRODUCTION

Murraya exotica L. and *Jasminum* sp. are pot flowers for inside decoration. Both have the flower with her oriental and delightful scent as the central attraction. Also, *Murraya exotica* L. is very appreciated for his arbustive port with white bark contrasting with the bright green leaves and the presence of the coloured fruits all over the year. *Jasminum* sp. is a voluble and fast growing plant and because of those features, the plants are leaded on different types of supports. The growing and blossoming of the plants are in direct relationship with the intensity of the plant physiological processes. From this point of view, we consider that is necessary to collect more data to support the technological measures taken in order to optimize and scheduling the plants culture.

MATERIALS AND METHODS

The experiment was carried out this year in the framework of the Experimental Glasshouse of the Floriculture Department of Horticulture Faculty and the biological material was represented by the *Murraya exotica* L. and *Jasminum* sp. The culture substrates are composed by different mixture in distinct proportions: white peat, red peat, lawn soil and perlite. These represent the first experimental variants (table 1). In the control substrate was added marc of grapes in different amounts (table 2) and from different years, resulting the second experimental variants group.

With the LCA-4 Portable Photosynthesis System (fig. 1) it was measured the intensity of the photosynthesis, transpiration, respiration and stomatal conductance. These measures have been taken in the end of September, when the plants of *Murraya exotica* L. was in full blossom and *Jasminum* sp. after the blossoming wave. A shiny day was chosen and the device readings were taken around 11:00 o'clock. Physiological processes were recorded from the main leaf of the leaflet and in the inflorescence proximity.

RESULTS AND DISCUSSIONS

Observing the plants evolution on the different substrates, it has been noted them influence upon the vegetative growth and blossoming of the flowers. From the previous researches, it was also observed that the presence of the marc of grapes in the substrates induced a decrease of the plants vigour and a lower number of leaves, but the number and the length of the ramifications were similar to the other substrates.

Concerning the intensity of some physiological processes of *Murraya exotica* L. and *Jasminum* sp, it were remarked differences between the values recorded for the variant groups and the variants inside the group.

As a common observation for both species, the intensity of photosynthesis, transpiration and respiration of the flowers cultivated in the substrates without marc of grapes was higher than the variants which have marc of grapes added in the substrate. The control recorded values that exceed the values registered for the rest of the variants and this is valuable for all the physiological processes. Nevertheless, for the *Jasminum* sp plants, the variants V5a and V6a has been emphasized with bigger values for the main physiological processes (table 3) at a light intensity around the 1550 μmol/m^2/s. The lowest physiological processes rates were observed at the V9A variant.

In *Murraya exotica* L. case, the physiological processes were recorded at a light intensity around 1100 μmol/m^2/s which explains somehow the reduced values of the metabolic processes. Looking at the 4th table data, the V5a variant is distinguishing from the rest of the variants with higher values for photosynthesis (2,95 μmol CO_2/m^2/s), transpiration (0,22 mmol H_2O/m^2/s) and respiration (1,22 μmol CO_2/m^2/s) but the stomatal conductance was under the detection limit.

At the variants with the marc of grapes added in the substrate it could be observed that the different amount of the marc of grapes influenced the intensity of the physiological processes. Thus, the V9A and V6A variants recorded the lowest intensity rates. For *Jasminum* sp., the V9A variant with a low synthesis capacity (0,53 μmol CO_2/m^2/s) had a low intensity of transpiration too (0,05 mmol H_2O/m^2/s). The same V9A variant, but of the *Murraya exotica* L., proved the same behaviour: a small photosynthesis activity (1,04 μmol CO_2/m^2/s), a lower intensity of transpiration (0,025 mmol H_2O/m^2/s) and respiration (0,05 μmol CO_2/m^2/s).

CONCLUSIONS

The intensity of photosynthesis, transpiration and respiration of the substrates without marc of grapes was higher than the variants which have marc of grapes added in the substrate.

The control recorded the highest values registered for all the physiological processes. The V5a and V6a variants presented bigger values for the main physiological processes and the V9A the lowest.

The different amount of the marc of grapes influenced the intensity of the physiological processes.

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Table 1

Experimental variants - diferent mixture of substrates

Substrate component	V1a	V2a	V3a	V4a	V5a	V6a	V7a	V8a (C)
White peat	1	1	-	1	-	2	-	1
Red peat	1	-	1	-	1	-	2	1
Lawn soil	-	1	1	2	2	1	1	1
Perlite	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5

Table 2

Experimental variants – substrates with added marc of grapes

Marc of grapes	V1A	V2A	V3A	V4A	V5A	V6A	V7A	V8A	V9A	V10A (C)
2003	10%	25%	50%							
2004				10%	25%	50%				
2005							10%	25%	50%	

Table 3

The physiological processes intensity of *Jasminum* sp.

Variant	Light intensity ($\mu mol/m^2/s$)	Leaf temperature (^0C)	Photosynthesis ($\mu mol\ CO_2/m^2/s$)	Transpiration ($mmol\ H_2O/m^2/s$)	Respiration ($\mu mol\ CO_2/m^2/s$)	Stomatal conductance ($\mu mol\ /m^2/s$)
V1a	1562	33	2,35	0,37	3,01	0,02
V2a	1514	34	1,37	0,22	1,99	0,01
V3a	1565	39	2,23	0,54	2,5	0,02
V4a	1529	36	1,87	0,18	1,99	0,01
V5a	1565	34	3,34	0,96	2,77	0,03
V6a	1535	34	2,53	0,94	3,24	0,03
V7a	1588	37	2,45	0,33	1,37	0,02
V8a (Mt)	1580	37	3,65	0,82	3,82	0,04
V1A	1571	37	1,87	0,24	2,22	0,02
V2A	1565	38	1,67	0,35	0,53	0,01
V3A	1588	38	1,11	0,69	1,45	0,01
V4A	1547	39	1,52	0,36	0,5	0,02
V5A	1532	38	1,03	0,41	3,2	0,01
V6A	1583	36	1,09	0,29	0,29	0,02
V7A	1562	37	1,56	0,65	1,73	0,02
V8A	1585	38	0,67	0,58	1,65	0,01
V9A	1535	36	0,53	0,05	1,49	0,01
V10A (Mt)	1550	37	3,42	1,13	3,05	0,04

Table 4

The physiological processes intensity of *Murraya exotica* L.

Variant	Light intensity ($\mu mol/m^2/s$)	Leaf temperature (^0C)	Photosynthesis ($\mu mol\ CO_2/m^2/s$)	Transpiration ($mmol\ H_2O/m^2/s$)	Respiration ($\mu mol\ CO_2/m^2/s$)	Stomatal conduct-ance ($\mu mol\ /m^2/s$)
V1a	1104	31	2,05	0,21	1,12	UDL*
V2a	1105	32	1,00	0,11	0,49	UDL*
V3a	1108	33	2,12	0,14	0,87	UDL*
V4a	1108	34	0,76	0,15	0,25	UDL*
V5a	1108	35	2,95	0,22	1,22	UDL*
V6a	1108	35	2,11	0,18	1,21	UDL*
V7a	1102	35	1,13	0,14	0,45	UDL*
V8a (Mt)	1114	36	3,72	0,25	1,52	0,01
V1A	1100	36	2,02	0,22	0,82	UDL*
V2A	1070	36	1,53	0,17	0,06	UDL*
V3A	1100	37	1,28	0,04	0,03	UDL*
V4A	1100	36	1,57	0,12	0,65	UDL*
V5A	1100	36	1,02	0,05	0,29	UDL*
V6A	1200	36	0,25	0,04	0,22	UDL*
V7A	1197	36	1,03	0,14	0,60	UDL*
V8A	1120	38	1,14	0,05	0,08	UDL*
V9A	1117	38	1,04	0,025	0,05	UDL*
V10A (Mt)	1114	38	3,19	0,33	1,67	0,01

*UDL – under detection limit

Fig. 1. LCA-4 Portable Photosynthesis System - recording the physiological processes at *Jasminum* sp (left) and *Murraya exotica* L. (right)

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PRELIMINARY RESEARCH ON GENERATIVE PROPAGATION OF *EUODIA HUPEHENSIS* DODE (*RUTACEAE*)

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Keywords: pregermination, death rate, stratification, emergence, leaf pair

ABSTRACT

Euodia hupehensis Dode (*Tetradium hupehensis*) is woody specie cultivated in Romania only in dendrologycal collections and botanical gardens or as a source of late summer honey by beekeepers. In the perspective of introduceing it in the ornamental assortement, due to its decorative and biological qualities, it requires to establish the adequate propagation technology.

INTRODUCTION

The paper presents the influence of different pregermination treatments, in generative seedling production at the specie before mentioned.

MATERIAL AND METHOD

***Euodia hupehensis* Dode – hupeh evodia, evodia, or bee bee tree** is a tree with a hight of 20m and globulous crown. The bark is dark-grey. The shoots are glabrous, brown-red or bluish-green and with a lot of lenticels. The leaves resemble the foliage of an ash tree and are a glossy dark green in summer. In fall there is little color change and leaves tend to drop green to yellow-green. The tree is covered in late June and July with masses of large pyramidal white to gray cluster of small white flowers, particularly valued when few other woody species are flowering. It attracts large numbers of bees. The flowers produce clusters of seed that is present from September through November. The seeds start as bright brown-red capsules that when fully ripe open to expose shiny black buckshot seed as autumn progresses.

The experiment was conducted on the field in the botanical garden "I.Tudor" that belongs to the University of Agronomical Sciences and Veterinary Medicine of Bucharest.

We chose four variants grouped according the technological factors: the time of sowing and stratification

For each variant we have used a number of 90 seeds with 30 seeds on each replication. We choose a number of three replicatios for each variant.

The seeds were harvested in 17 November from plants growing in the botanical garden "I. Borza" in Cluj.

Experimental variants: $\mathbf{V_{1M}}$– seeds sown on the field in late autumn, established as control because it follows the classic technology for generative propagation; $\mathbf{V_2}$–seeds kept at room temperature and sown in greenhouse in early spring; $\mathbf{V_3}$ –seeds kept at room temperature, treated with magnetic water and sown in greenhouse in early spring; $\mathbf{V_4}$ – seeds stratified at a temperature of 1 – 5^{o}C, in moist sand, sown in early spring.

Time of sowing: December, 8 for V_{1M} and February, 20 for V_2, V_3 and V_4.

Pregermination treatment: The stratification was made in moist sand, and the mixture of seeds and stratification environment was kept in plastic bags kept into boxes berried in the ground outside, in a shady place.

The seeding in field was conducted in a nutritive bed on transversal rows, spaced out at 20 cm. The ground of leaves was the nutritive substratum used, displayed at a depth of approximately 10cm. A layer of leaves of 0.5 – 1cm was placed on the surface to keep the moisture.

The seeding in greenhouse was conducted in boxes filed with a nutritive mixture made of ground of leaves and pot ground. Each box was filed at the bottom with o drainage layer made of grit. The boxes with seedling were carried out at the date of May 17, because the temperatures in greenhouse were too high.

Experimental data: the emergence was recorded with the germination percentage and biometric parameters were determined (plant propagation, the number of in the vegetation period, the death rate for the saplings, the plant height).

RESULTS AND DISCUSSIONS

The Percentage of Emergence. For the V_1M variant the emergence was none because the seedling in field conditions. We know that *Euodia hupehensis* Dode is a termofil plant. The drought associate with low temperatures in 2007 winter reduced the seed viability and finally killed the embryos.

The greenhouse culture assures the succes of "hupeh evodia" seedlings. We can observe this at V_2, V_3 and V_4 variants (table no. 1). The highest emergence is riched by V_4 variant (56.66%) with seeds stratified at a temperature of 1 – 5^oC, in moist sand, sown in early spring. The stratification conditions (low temperature and high humidity) assure a good keeping of embryos viabilty than temperature and humidity conditions from the storage room.

The Saplings Death Rate. The V1M variant is out of discussions because there are no saplings (table no. 2). The highest death rate (30%) is riched by the V2 (seeds kept at room temperature and sown in greenhouse in early spring). This is dued to seedling conditions-plant density who determin a reduced light an reduced soil volume. The lowest death rate (3.44%)is observed at V_3 (seeds kept at room temperature, treated with magnetic water and sown in greenhouse in early spring). This is probably due to the effect of the magnetic water.

The Height Dynamics of the Saplings. The V_3 saplings had the biggest height dynamics during all vegetation period (40 cm in October). This is dued to the magnetic water seed treatement and mostly to the seedling conditions (light and soil volume). The lowest hight dynamics was riched by V_2 (31 cm in October) because the high density of plants and the weakness of the plants until the emergence (see the emergence precentage and the death rate).

The Foliage Dynamics of the Saplings. We observe that the leaves pairs have almost the same number at the V_2 and V_4 variants in June and August and at the V_3 and V_4 variants in May and July (fig. 2). Generally is obvious that the V_3 variant have the highest number of leaf pairs during the vegetation period (10 leaf pairs). Finally the most reduced foliage is at V_4 (8 leaf pairs).

CONCLUSIONS

According the emergence observations it is not recommended to sow the "hupeh euodia" seeds in autumn directly in field. This is due to the frost sensibility of this plant and also of its seeds.

The Pregermination treatment with magnetic water is very favourable according to the saplings death rate, the height dynamics and the foliage dynamics observations.

To increase the emergence of "hupeh evodia" seeds is recommended to associate the Pregermination treatments: the stratification in moist sand at low temperature and the magnetic water treatment. This association of Pregermination treatments is not favourable only for the emergence but it assures the sapling production for this species (table no. 2, fig 1, fig 2).

The high death rate registered at V_2 it is due to the lush foliage of the plats from June till October (fig. 1). That's why the light condition is poor and determines an increase of the death rate.

We can observe also a correlation between the height dynamics and foliage evolution (fig. 1, fig. 2).

The magnetic water treatment associated with proper condition assures a good production of *Euodia hupehensis* saplings (V_3). The saplings obtained in this variant are very vigorous according the height rate and the number of leaf pairs (fig. 1, fig. 2).

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Table 1

The Percentage of Emergence for the Plants of *Euodia hupehensis* Dode

Variant	No. of seeds	No. of plants in 7 may/ replication			No. of plants/variant	% emergence
		R_1	R_2	R_3		
V_{1M}	90	0	0	0	0	0
V_2	90	9	7	4	20	22.22
V_3	90	12	9	8	29	32.22
V4	90	20	17	14	51	56.66

Table2

The Death Rate for the *Euodia hupehensis* Dode saplings

Variant	No. of plants in 7 May	No. of plants in October 20/ replication			No. of plants/variant	No. of dead plants	% death rate
		R_1	R_2	R_3			
V_{1M}	0	0	0	0	0	0	0
V_2	20	7	4	3	14	6	30
V_3	29	12	9	7	28	1	3.44
V4	51	17	15	13	45	6	11.76

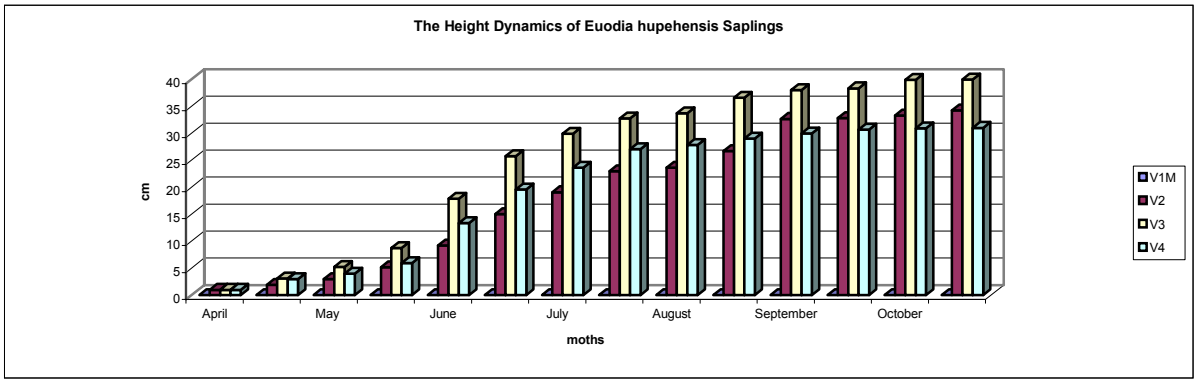

Fig. 1. The Height Dynamics of *Euodia hupehensisi* Dode saplings

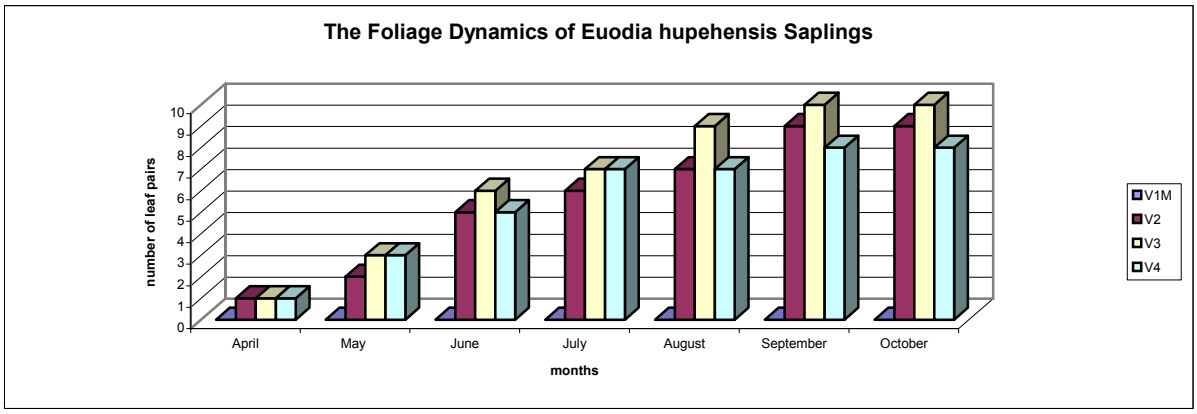

Fig. 2. The Foliage Dynamics of *Euodia hupehensisi* Dode saplings

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RESEARCH ON GENERATIVE PROPAGATION OF THE WOODY SPECIES *PALIURUS SPINA-CHRISTI* MILLER AND *SORBUS INTERMEDIA* (EHRH.) PERS

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Keywords: pregermination, scarification, deviation, ornamental, stratification

ABSTRACT

Sorbus intermedia (Ehrh.) Pers. (Rosaceae) and *Paliurus spina-christi Miller (Rhamnaceae)* are two species cultivated in Romania only in dendrologycal collections and botanical gardens. In the perspective of introducing them in the ornamental assortment, due to their decorative and biological qualities, it requires to establish the adequate propagation technology.

INTRODUCTION

The paper presents the influence of different pregermination treatments, in generative seedling production at the species before mentioned.

MATERIAL AND METHOD

***Paliurus spina-christi* Miller –Christ's thorn:** spontaneous shrub in the dry rocky Dobrogean regions; it grows up to 3 – 6 m in height, sometimes arborescent, having a high ornamental potential because of its glossy foliage with specific texture, nice smelling flowers, particularly shaped fruits (spherical with a round winglet) which can be seen on the plant even in late winter and small thorns displayed in pairs at each and every joint. As it is a rare draught-resistant species, it is important for the biodiversity of arid regions, where the range of plants is quite poor.

***Sorbus intermedia* (Ehrh.) Pers – Swedish white beam:** origin in Northern Europe. It is a shrub or tree up to 10m in height. The leaves are pennate-lobate and downy, yellowish-grey on the back. The flowers are displayed in downy corymbs. Flowering V. The fruit is red-orange, 12 mm in diameter. Fruits mature in IX – X. Many foreign profile research works recommend it for various applications in green spaces due to its particular ornamental qualities (rich in flowers, the colour of its flowers and fruits) and resistance to urban environment.

The experiment was conducted on the field in the botanical garden "I. Tudor" that belongs to the University of Agronomical Sciences and Veterinary Medicine of Bucharest.

I. *Paliurus spina-christi* Miller

We chose six variants grouped according to two technological factors:

- the time of sowing and stratification
- scarification of seeds (fruits)

For each variant we have used a number of 50 seeds (fruits).

The fruits were harvested in late November from plants growing in the botanical garden "D. Brândză" in Bucharest.

Experimental variants: **V1aM** – seeds sown on the field in autumn, unscarified, established as control because it follows the only suggestion for propagation in the field literature in Romania; **V1b** – scarified seeds, sown on the field in autumn; **V2a** – unscarified

seeds, stratified in the cooler at a temperature of 1-5^{o}C, in moist sand, sown in spring; **V2b** – scarified seeds, stratified in the cooler at a temperature of 1-5^{o}C, in moist sand, sown in spring; **V3a** – unscarified seeds, stratified in a cellar at a temperature of 10-15^{o}C, in moist sand, sown in spring; **V3b** – scarified seeds, stratified in a cellar, at a temperature of 10-15^{o}C, in moist sand, sown in spring.

Time of sowing in autumn – November, 30 for V1aM and V1b variants and in spring – April, 4 for variants V2a, V2b, V3a, and V3b with stratified seeds.

Pregermination treatment: scarification method applied on seeds (fruits): a fissure was pierced in the woody epicarp. The stratification was made in moist sand, and the mixture of seeds and stratification environment was kept in plastic vessels with pierced lids.

The seeding was conducted in a nutritive bed on transversal rows, spaced out at 10 cm. The ground of leaves was the nutritive substratum used, displayed at a depth of approximately 20 cm. A layer of sand of 0.5-1cm was placed on the surface. 50 seeds were used for each variant

II. *Sorbus intermedia* (Ehrh.) Pers

We chose three variants grouped up according to the methods employed for stratifying the seeds.

The fruits were harvested on October, 27, fro the only existing tree (at this species the apomixes is very common) in the collection of the "D. Brândză" botanical garden in Bucharest.

Experimental variants: **V1M** – seeds sown on the field in autumn; **V2** – seeds stratified in the cooler at a temperature of 1-5^{o}C, in moist sand; **V3** – seeds stratified (stored) in the cooler at a temperature of 1-5^{o}C, in hermetically closed vessels, with no stratification environment.

Time for seeding: In autumn – November, 30 for variants V1M and in spring – April, 4 for V2 and V3 variants with stratified seeds.

The seeds were extracted from fruits (kernel fruits) by using the method suggested by the research works on arboriculture, maceration of pulp followed by separation.

The seeding was conducted in a nutritive bed on transversal rows, spaced out at 10 cm. The ground of leaves was the nutritive substratum used, displayed at a depth of approximately 20 cm. A layer of sand of 0.5-1 cm was placed on the surface. 50 seeds were used for each variant

Experimental data: the emergence was recorded with the germination percentage and biometric parameters were determined (plant propagation, the number of branches at the end of the vegetation period and the index of uniformity was determined by using the statistical formula for deviation – the difference between the average experimental value and each and every value taken separately).

RESULTS AND DISCUSSIONS

I. *Paliurus spina-christi* Miller

The Percentage of Emergence: the fruits of *Paliurus* contain 1 to 3 seeds in the conditions provided by the Dobrogean environment. Taking into consideration the fact that the fruits used during the experiment come from plants grown in the environment offered by the climate in Bucharest, it comes down to an average number of 1 (one) viable seed per fruit. Thus, he highest percentage of plants was reached by employing the technology used for V3a (unscarified seeds, stratified in a cellar, in moist sand, sown in spring), and the lowest for V3b (scarified seeds, stratified in a cellar, in moist sand, sown in spring).

One can see that the technologies involving stratification registered better results, the same is valid for unscarified seeds as against scarified. On the contrary, in the case of technologies without stratification, the scarified seeds in V1b (sown on the field in autumn) had a higher percentage of emergences, as against the unscarified ones in V1aM (unscarified seeds sown on the field in autumn).

The 2006 experiment showed a low degree of emergence for the fruits of *Paliurus* (a maximum value of 30%), the best results were obtained for V3a and V1b, while the lowest/for V3b.

The Dynamics of Emergence: the first plantlet emerged in variant V3b (scarified seeds, stratified in a cellar, in moist sand, sown in spring) (April, 12), and the last emerged in variant V3a (unscarified seeds, stratified in a cellar, in moist sand, sown in spring) (August, 7).

While recording the number of emerged plants, we noticed that the rhythm of emergence was increasing progressively until July in a different manner, according to each variant (faster for V2a, V1b and V3a).

The complete, but very low emergence occurred in June for V2b and V3b, in July for V1b and the control, and in August for the variants left (V2a and V3a).

The Height of the Plants of *Paliurus spina-christi* Miller: the graphic shows that the plants registering the best growth index are those in the V1M variant (seeds sown on the field in autumn, unscarified), followed by those in V2b (scarified seeds, stratified in the cooler at a temperature of 1-5^{o}C, in moist sand, sown in spring).

By analyzing the non-uniformity index of the seedlings obtained by various technologies employed one can see that the plants in variant V2b (scarified seeds, stratified in the cooler at a temperature of 1-5^{o}C, in moist sand, sown in spring) are the most homogenous in point of height reached in the first year of vegetation, followed by those in variant V1aM (seeds sown on the field in autumn, unscarified).

Variant V3b (scarified seeds, stratified in a cellar, in moist sand, sown in spring) is inconclusive, as in it only one single plant emerged, i.e. this is the technology with the lowest efficiency.

In point of the number of branches emerged on plants, variant V1aM (seeds sown on the field in autumn, unscarified) has the highest average, followed by V2b. in this case, due to the margin effect, the way the plantlets grew in variant V2b (scarified seeds, stratified in the cooler at a temperature of 1-5^{o}C, in moist sand, sown in spring) is considered to be conclusive.

II. *Sorbus intermedia* (Ehrh.) Pers

The Percentage of Emergence: the best efficiency occurred in variant V1M (seeds sown on the field in autumn), where the highest number of plantlets was registered.

The lowest percentage of emergence/survival was noticed in the case of the seeds stored in the cooler in closed vessels, with no stratification environment.

The graphic shows that the tallest plantlets emerged in variant V1M (seeds sown on the field in autumn). In variants V2 (seeds stratified in the cooler at a temperature of 1-5^{o}C, in moist sand) and V3 (seeds stratified (stored) in the cooler at a temperature of 1-5^{o}C, in hermetically closed vessels, with no stratification environment) the plants' height was similar.

The Dynamics of Emergence: it was observed on each variant during vegetation.

In variant V1M (seeds sown on the field in autumn) one can notice a uniform emergence since the very first month of vegetation, the plantlets become visible on the surface of the soil from the first days of March. On April, 5, the plantlets had their cotyledons fully developed.

The Height of the Plants of *Sorbus intermedia* (Ehrh.) Pers: in variant V2 (seeds stratified in the cooler at a temperature of 1-5^{o}C, in moist sand) the seeds had already sprouted which led to a delay in emergence. From the first plantlets emerged on April, 15, the rhythm of their mergence focused until May with a slight persistence in June.

Since June until November a constant number of seedlings was preserved in all variants.

In point of the **uniformity of the plants** one can notice that in V3 only (seeds stored in the cooler at a temperature of 1-5^{o}C, in hermetically closed vessels, with no stratification environment) the seedlings had less relevant growth, but the small number of plants makes these results irrelevant. In the other two variants V1M (seeds sown on the field in autumn) and V2 (seeds stratified in the cooler at a temperature of 1-5^{o}C, in moist sand), the lack of uniformity is high, which probably resulted from the genetic background of the seeds (the species is apomictic – inbreeding occurs).

CONCLUSIONS AND RECOMMENDATIONS

Conclusions:

I. *Paliurus spina-christi* Miller

- In point of quantity, the variant using unscarified seeds, stratified in a cellar in moist sand has gives the best results;
- By comparing the results in all variants, the technology employing unscarified seeds stratified in a cellar sown in spring proved to be advisable, as it registered the highest emergence percentage, though the growth of the seedlings is relatively average in quality, a feature that can be alleviated by other cultural measures (fertilization, irrigation, pinching off).
- Unscarified fruits stratified and sown in spring had a faster emergence rate during the first months of spring (they enjoy the humidity of the soil during the first part of the vegetation period), followed by the continuation of the emergence at a slower rate until August.
- The autumn scarification and sowing (V1b) led to a better rate of emergence until July and an emergence percentage higher than the control.
- The spring sowing with unscarified fruits that had undergone stratification led to the highest emergence percentage. Scarification showed good results only for autumn sowing.
- The technology that the specialized literature suggests (unscarified fruits sown in autumn) leads to the best growth rate of the seedlings; good growth rates were registered for spring sowing of scarified fruits stored stratified in a cooler.

II. *Sorbus intermedia* (Ehrh.) Pers

- The seedlings of *Sorbus* emerge at a fast rate until May;
- The variant involving seeds sown in autumn in the field which follows the technology most commonly employed had the best results in point of the number of seedlings obtained;
- In point of quality, the results registered in all variants led to seedlings of very different heights.

Recommendations:

I. *Paliurus spina-christi* Miller

- To develop research on the consequences of the spaces between the rows in sowing and between the plants on a row;
- The lack of uniformity and growth of the plants can be caused by the annual conditions and the environment in which the mother-plants developed – it is advisable to look for sources of seeds from the natural habitat – Dobrodgea;

- To study new variants of pre-germination treatment applied directly on seeds extracted from fruits;
- To conduct sowing in greenhouse environment, taking into consideration that the species is thermophil (recommended by the field literature form Germany).

II. *Sorbus intermedia* (Ehrh.) Pers

- It is advisable to use seeds coming from seed tree displayed in groups (to reduce the phenomenon of apomixes by cross pollination);

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Table 1

The Dynamics and Percentage of Emergence for the Plants of *Paliurus Spina-Christi*

Month	No. of seeds	month V	month VI	month VII	month VIII	month IX - XI	% emergence
V1aM	50	1	5	**6**	**6**	**6**	12
V1b	50	2	8	**13**	**13**	**13**	26
V2a	50	1	8	10	**11**	**11**	22
V2b	50	3	**4**	**4**	**4**	**4**	8
V3a	50	1	4	13	**15**	**15**	30
V3b	50	**1**	**1**	**1**	**1**	**1**	2

Table 2

The Dynamics and Percentage of Emergence for the Plants of *Sorbus intermedia*

Variant	No. of seeds	month V	month VI	month VII	month VIII	month IX - XI	% of emergence
V1M	**50**	**29**	**29**	**29**	**29**	**29**	58
V2	50	14	**16**	**16**	**16**	**16**	32
V3	50	1	**2**	**2**	**2**	**2**	4

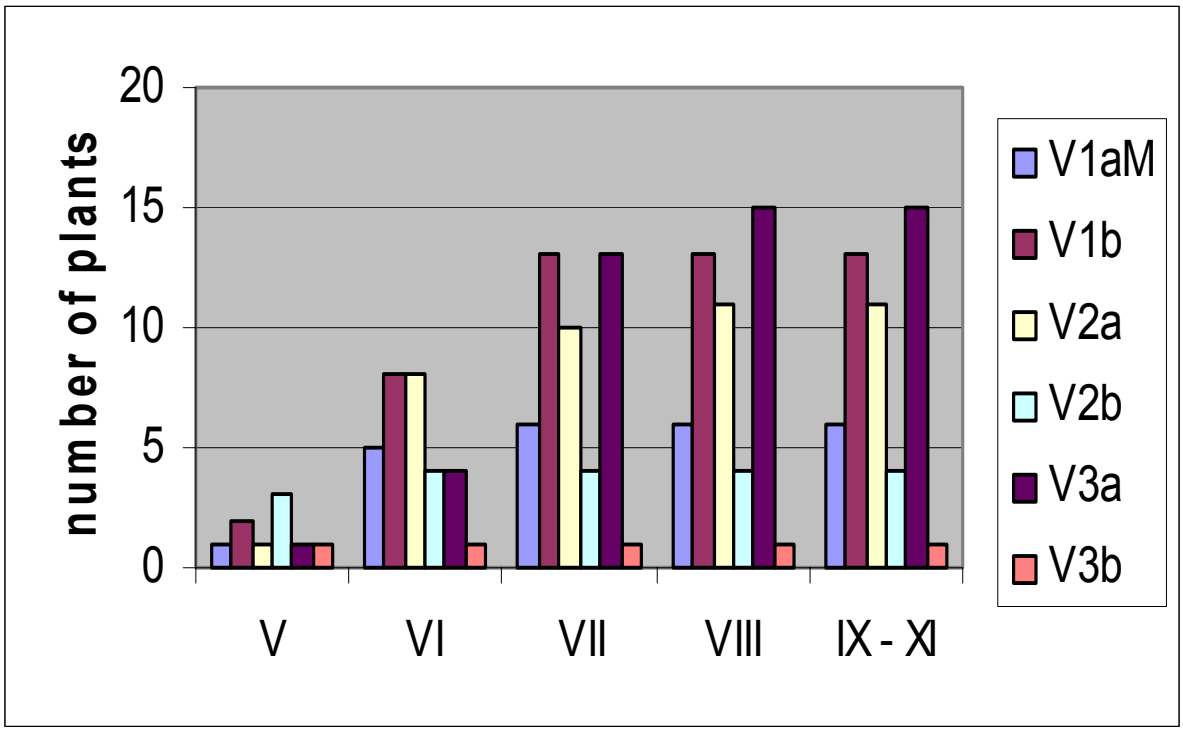

Fig. 1. The Dynamics of Emergence for the Plants of *Paliurus Spina-Christi* Miller

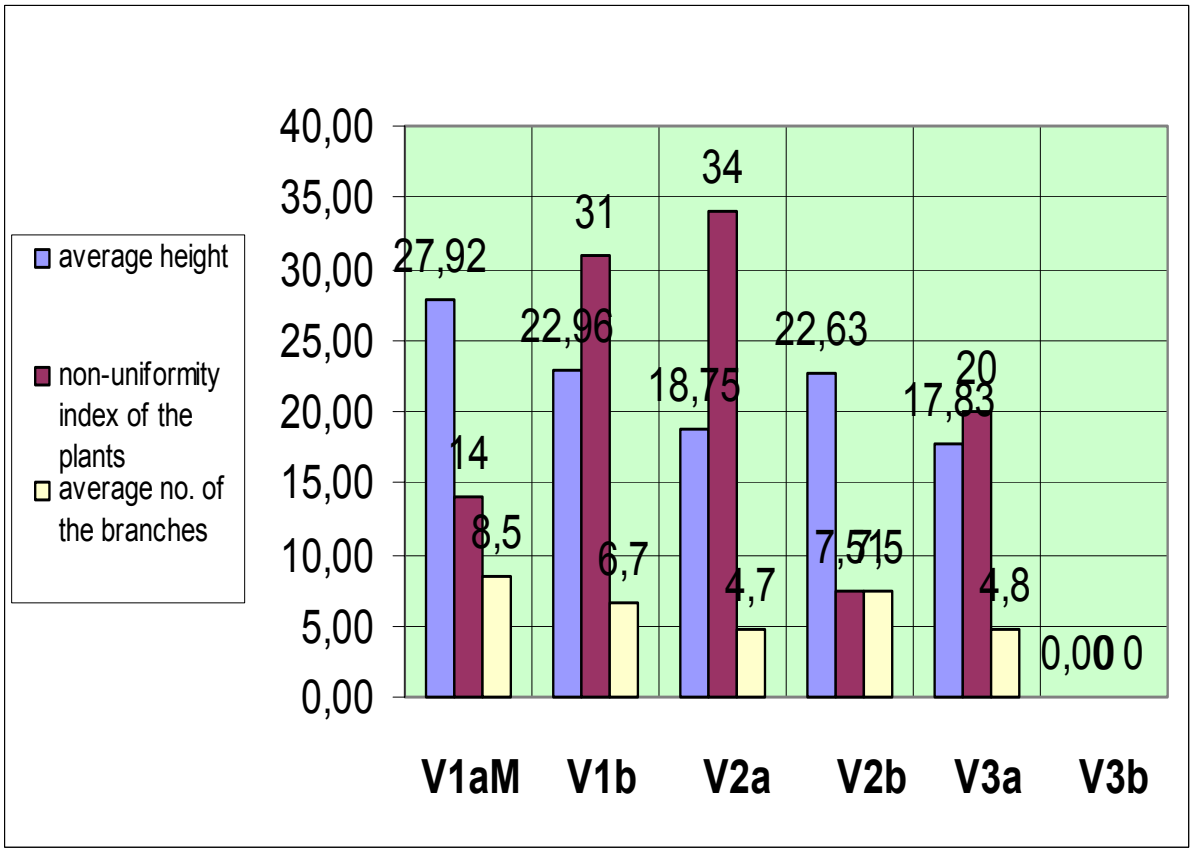

Fig. 2. The Height and Uniformity of Plants and the Average Number of Branches at the End of the Vegetation Period (Oct. 2006)

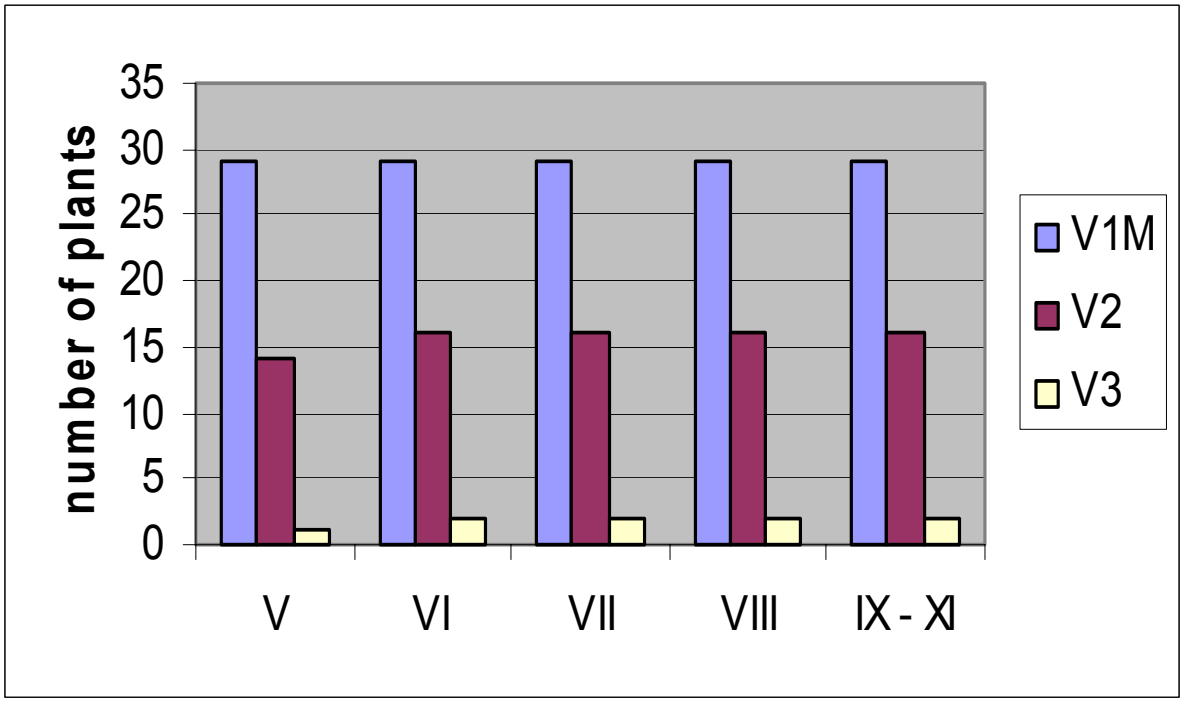

Fig. 3. The Dynamics of Emergence for the Plants of *Sorbus intermedia*

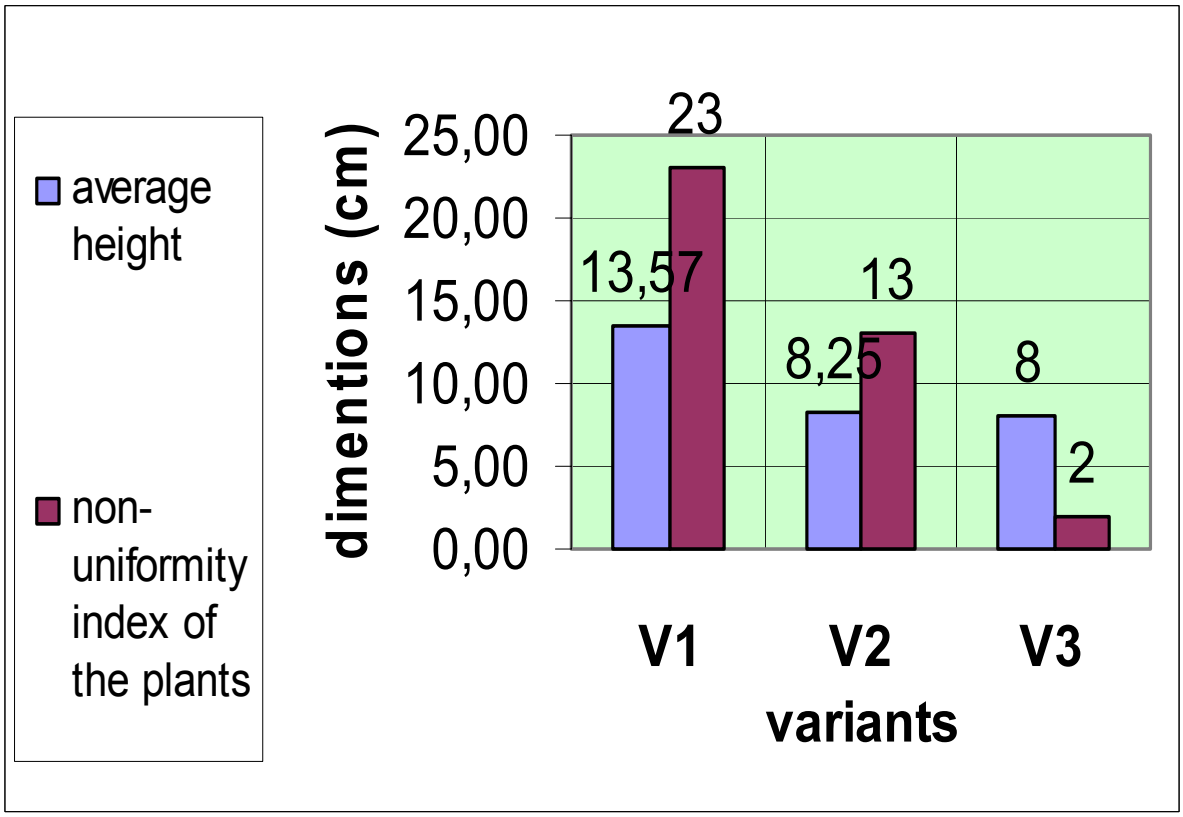

Fig. 4. The Height of the Plants at the End of the Vegetation Period and Their Uniformity

Lucrări ştiinţifice U.Ş.M.A.V.B., Seria B, Vol. L, 2007

THE INFLUENCE OF GIBBERELLIC ACID TREATMENTS ON *PAEONIA PEREGRINA* SEEDS GERMINATION, UNDER COLD FRAME CONDITIONS

CUCU Elena Ioana

Keywords: peony, seeds, dormancy, germination stimulators

ABSTRACT

The purpose of this study was to reveal the response of Paeonia peregrina seeds to various concentrations of gibberelic acid treatments. The results showed that lower concentration (150 mg/l GA_3) promoted a higher percent of germinated seeds with radicle > 5cm length, while the higher concentration stimulated radicle length growth (maximum).

INTRODUCTION

The biology of Paeonia seed germination is interesting due to the type of dormancy these seeds show: ***epicotyl dormancy***, which means the germination process takes place in two distinctive steps. In the first step, the radicle release from dormancy occurs during a warm period of 1 to 3 months, while, in the second step, the epicotyls dormany is overcome by a subsequent chilling period of 1 to 3 months. The results of germination process in *Paeonia* genus highly varies with the specie, with the seeds harvesting period, with the temperature conditions etc.

The embryo itself seems to be missing of growth promoters, as *in vitro* experiences with *Paeonia ostii var. lishizhenii* had shown, by soaking seeds in GA_3 which promoted radicle growth (Wang H., van Staden J., 2002).

In vivo results with *Paeonia peregrina* is to be shown in this study.

Paeonia peregrina Miller is rare and vulnerable specie (Red List of Superior Plant in Romania, 1994), growing naturally in Comana Forest, in Giurgiu district.

MATERIALS AND METHODS

The seeds were harvested from a population of *Paeonia peregrina* specie located in "Dimitrie Brandza" - Botanical Garden from Bucharest, at the end of June 2006.

On 13 October 2006, two hundred seeds (200) were used for experiences under cold frame conditions. Five experimental variants were used (each of 40 seeds): 4 different concentrations of gebberellic acid (GA_3) to stimulate germination, plus the control. The 5 variants were as following:

V_1= Control (Mt)
V_2= 150 mg/l GA_3;
V_3= 300 mg/l GA_3;
V_4= 500 mg/l GA_3;
V_5= 1000 mg/l GA_3;

The seeds were soaked in GA_3 for 24 hours, at room temperature.

After this period, seeds of each variant were put in plastic bags filled with wet peat (Professional Cultivation Peat Substratum II), in order to keep it moist. Then the bags were buried in 13-cm-diameter pots filled with common soil, to protect them from freezing. The germination process was kept under weekly observations.

From the moment the radicle emerged, biometrical measurements were made.

RESULTS AND DISCUSSIONS

The breaking seed coat stage was sporadically shown at the beginning of December 2006. The highest percent germination was recorded on January 3rd (table 2), while the highest percent regarding epicotyls emergence was recorded on January 14th (table 3).

It was shown a strong connection between radicle length and epicotyls emergence, just as the speciality literature had mentioned. It was demonstrated that, for peony, 85% of the epicotyls exposed to 7 weeks of chilling grew if the radicle had reached 4 cm in length. In contrast, only 40% of the epicotyls were released from dormancy under the same conditions with smaller 2-3 cm radicles (Geneve R., 2003). Personally, I took the 5 cm length as reference length for germinated seeds.

Results interpretation reported to data recorded on January 3rd :

- The *highest* number of germinated seeds with *radicle > 5cm length* (27) was recorded in V_2. Procentually speaking, this means 67.5%;
- The *smallest* number of germinated seeds with *radicle > 5cm length* (15) was recorded in V_4 (37.5%);
- The *highest* number of germinated seeds with *radicle < 5cm length* (20) was recorded in V_1 (50%);
- The *highest ungerminated* seed number (13 seeds, equaly 32.5%) was recorded in V_5, and the smallest (3 seeds, meaning 7.5%) was shown by V_1;
- The *highest total germinated* seed number (seeds with radicle > 5cm length + seeds with radicle < 5cm length) was shown by V_1 (37 seeds, meaning 92.5%);
- The *highest average radicle length* (7.18 cm) was recorded in V_5, while the *smallest* (5.94 cm) in V_1;

CONCLUSIONS

1. It was confirmed the conclusion that there is a strong conection between radicle length and the epicotyl emergence in Paeonia peregrina too;
2. The *highest* number of germinated seeds with *radicle > 5cm length* (27) was recorded in V_2, treated with 150 mg/l GA_3;
3. The *highest average radicle length* (7.18 cm) was recorded in V_5, treated with 1000 mg/l GA_3.

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Table 1. The situation of *Paeonia peregrina* germination process in cold frame conditions, on date 23.12.2006:

Var.	No. of germinated seeds without epicotyl and with		Average length of seeds without epicotyl and with radicle > 5 cm	No. of seeds with epicotyl and with		Average length of seeds with epicotyl and with	
	radicle > 5 cm	radicle < 5 cm		radicle > 5 cm	radicle < 5 cm	radicle > 5 cm (cm)	radicle < 5 cm (cm)
V 1	5	32	–	–	–	–	–
V 2	–	32	–	3	–	–	–
V 3	–	25	–	3	–	–	–
V 4	–	20	–	2	–	–	–
V 5	–	20	–	4	–	–	–

Table 2. The situation of *Paeonia peregrina* germination process in cold frame conditions, on date 03.01.2007:

Var.	No. of germinated seeds without epicotyl and with		Average length of seeds without epicotyl and with radicle > 5 cm	No. of seeds with epicotyl and with		Average length of seeds with epicotyl and with	
	radicle > 5 cm	radicle < 5 cm		radicle > 5 cm		radicle > 5 cm	radicle < 5 cm
V 1	17	20	5.9	–	–	–	–
V 2	27	8	6.4	3	–	8.8	–
V 3	18	11	6.2	3	–	9	–
V 4	15	14	6.2	2	–	8.8	–
V 5	19	8	7.2	4	–	10.2	–

Table 3. The situation of ***Paeonia peregrina*** germination process in cold frame conditions, on date 14.01.2007:

Var.	No. of germinated seeds without epicotyl and with		Average length of seeds without epicotyl and with radicle > 5 cm	No. of seeds with epicotyl and with		Average length of seeds with epicotyl and with	
	radicle > 5 cm	radicle < 5 cm		radicle > 5 cm		radicle > 5 cm	radicle < 5 cm
V 1	6	9	6.3	11	–	7.1	–
V 2	9	1	7.4	18	–	8.5	–
V 3	8	4	6.3	10	–	7.6	–
V 4	3	6	5.8	12	–	7.3	–
V 5	4	3	6	15	–	8.8	–

The situation of *Paeonia peregrina* germination process in cold frame conditions, on date 03.01.2007

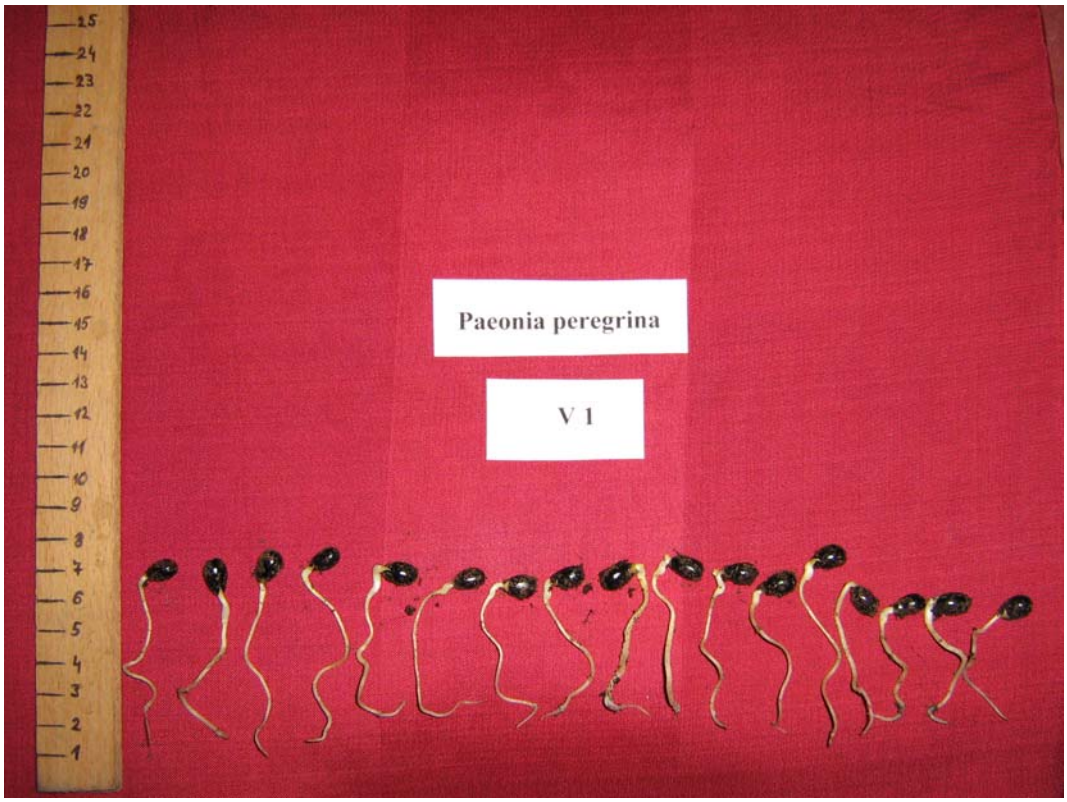

Photo 1— V_1, seeds with radicle > 5 cm

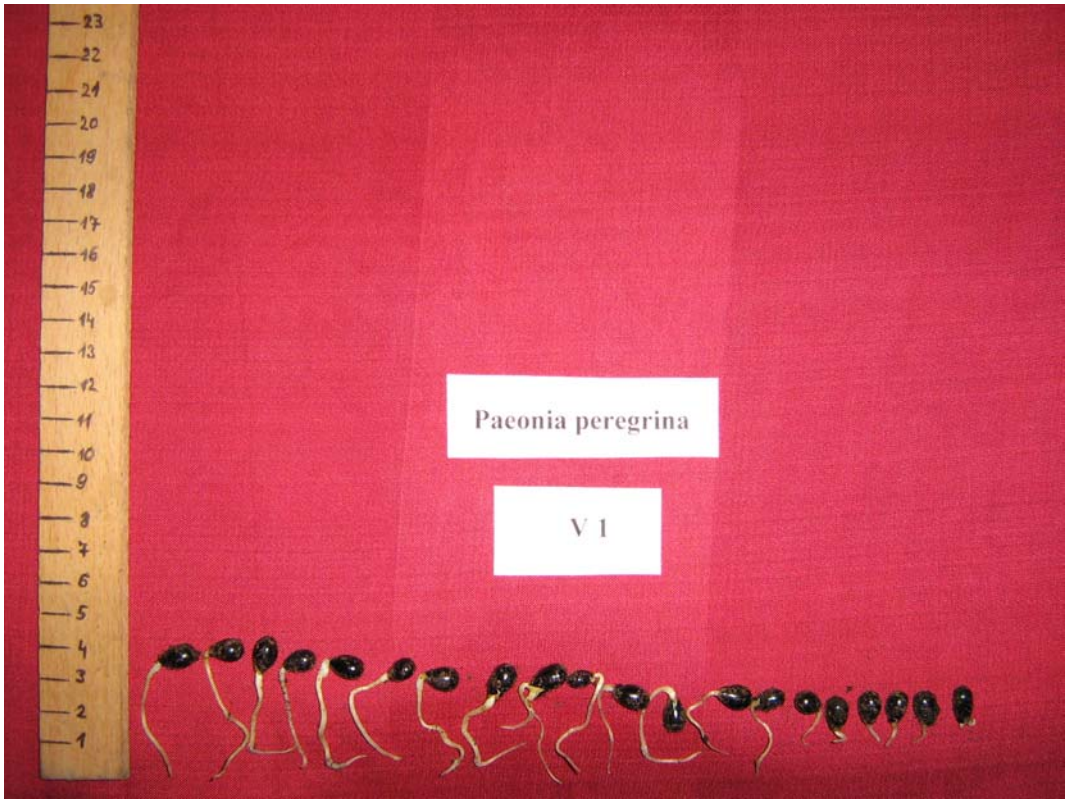

Photo 2 —V_1, seeds with radicle < 5 cm

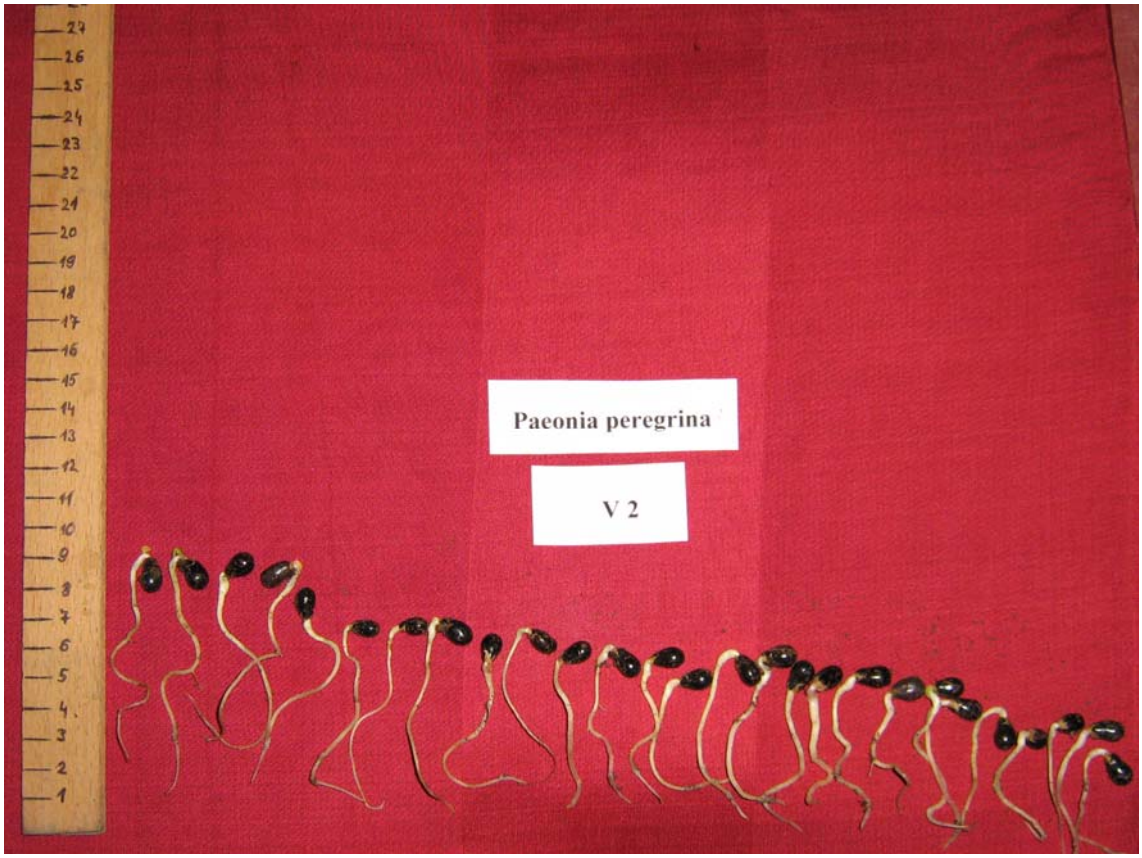

Photo 3 —V_2, seeds with radicle > 5 cm

Photo 4— V_2, seeds with radicle < 5 cm

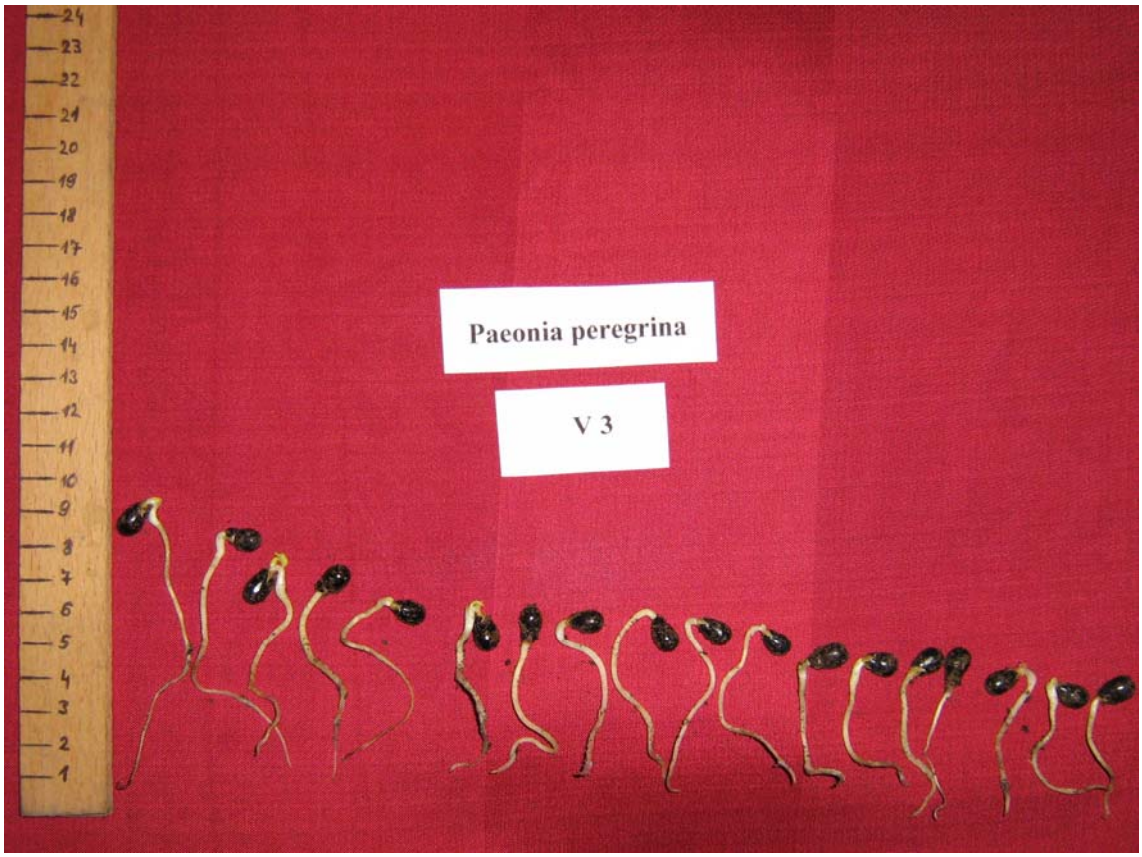

Photo 5 —V_3, seeds with radicle > 5 cm

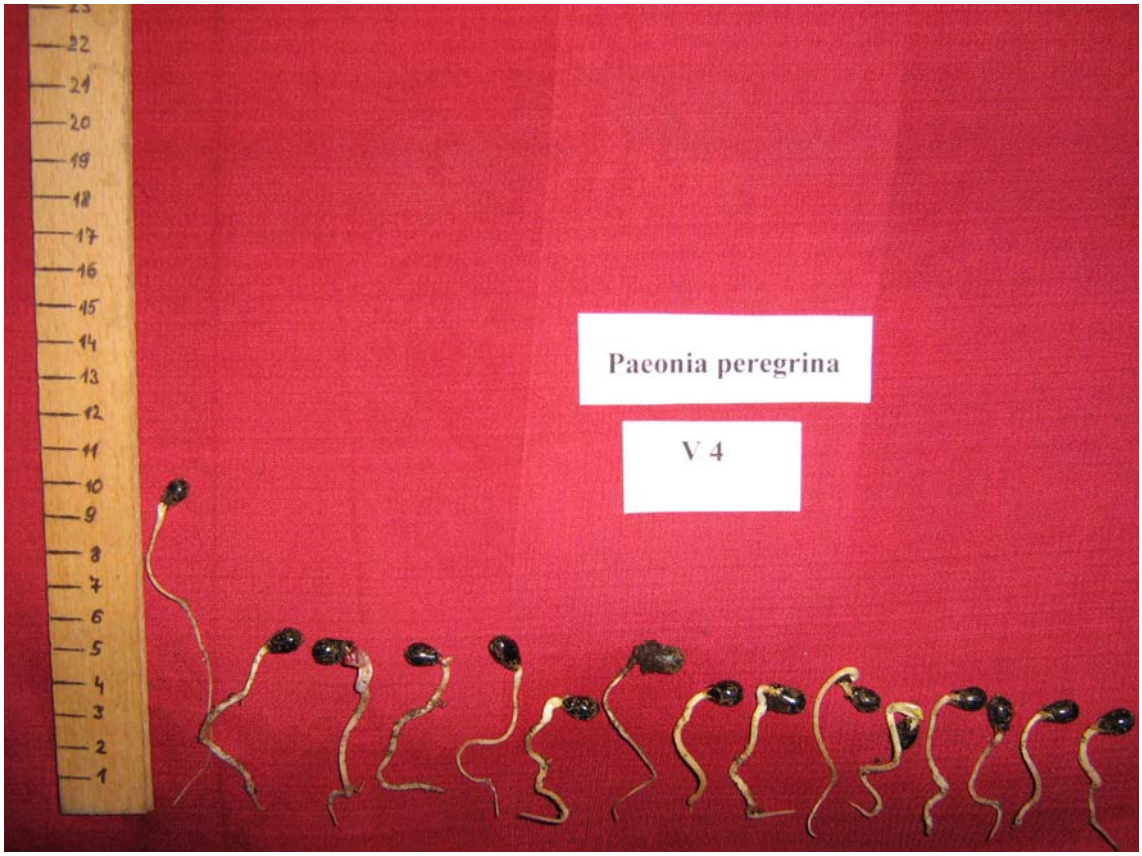

Photo 7 —V_4, seeds with radicle > 5 cm

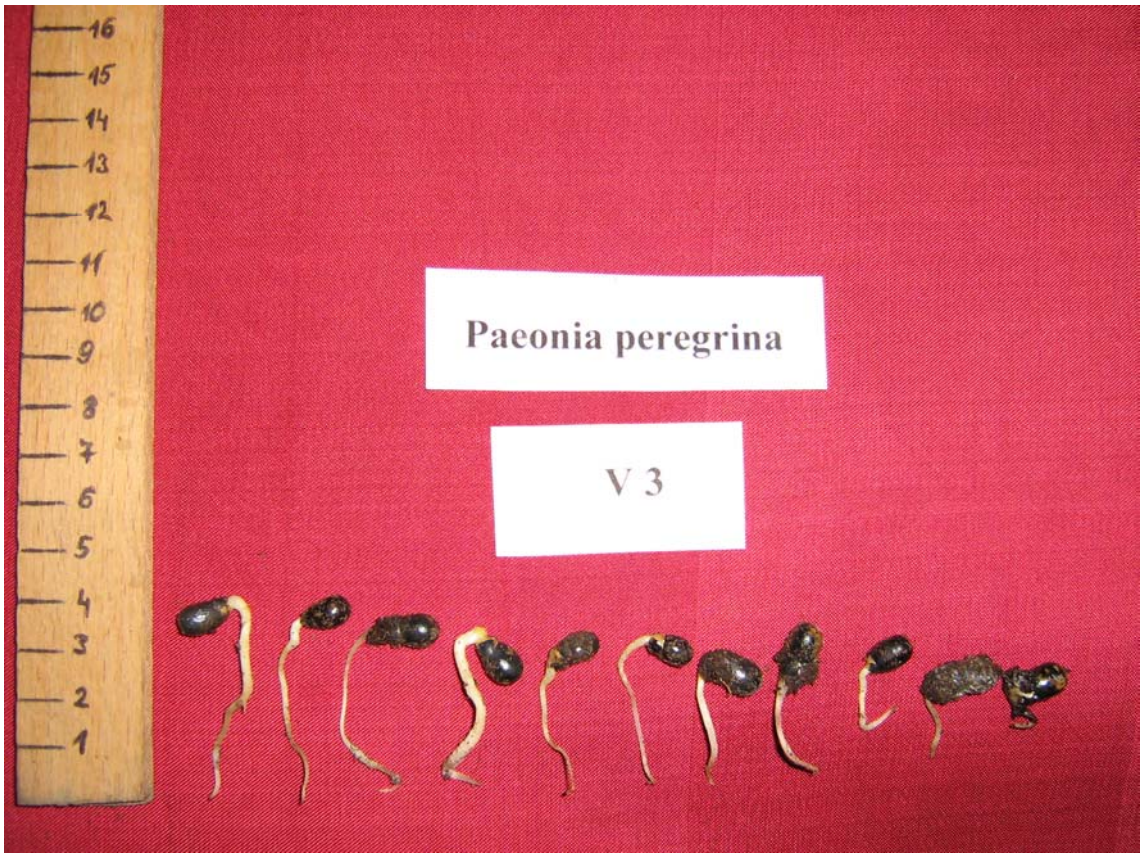

Photo 6 —V_3, seeds with radicle < 5 cm

Photo 8 —V_4, seeds with radicle < 5 cm

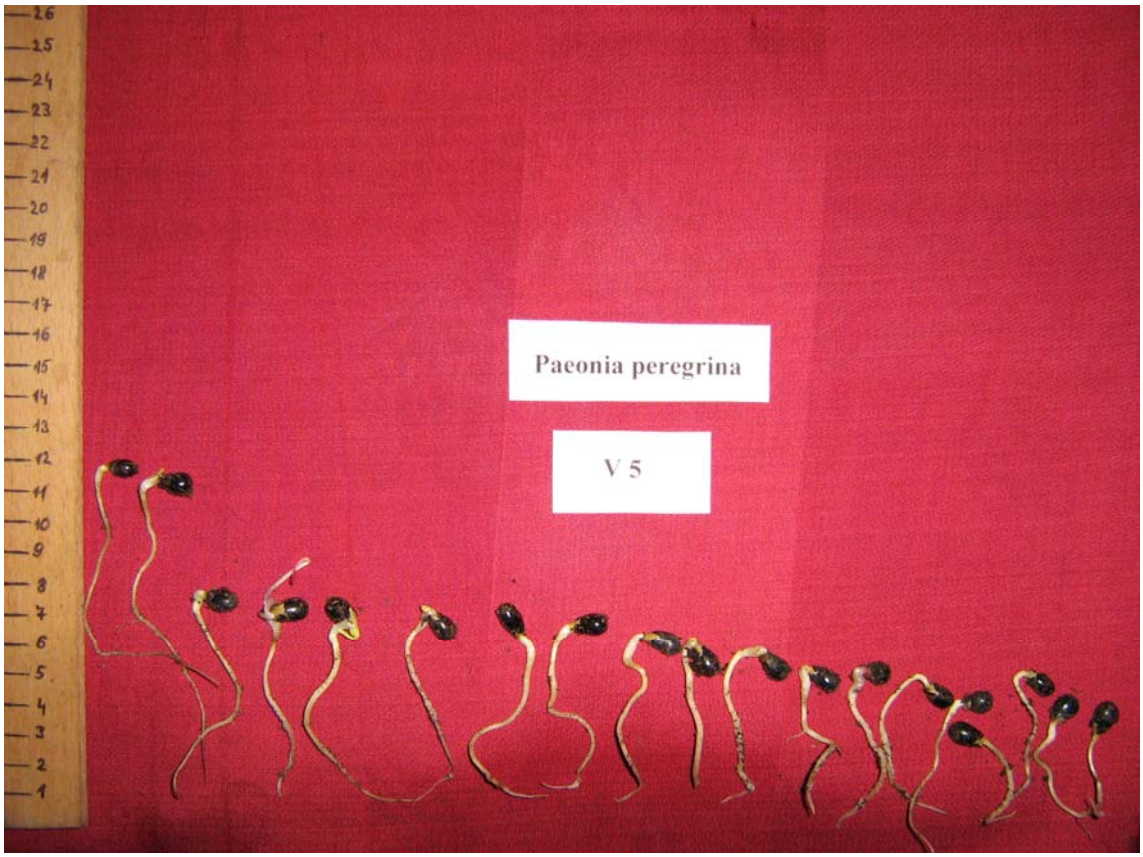

Photo 9 —V_5, seeds with radicle > 5 cm

Photo 10 —V_5, seeds with radicle < 5 cm

Lucrări ştiinţifice U.Ş.M.A.V.B., Seria B, Vol. L, 2007

STREET PLANTATION INVENTORY, AN IMPORTANT COMPONENT OF URBAN GREEN PATRIMONY MANAGEMENT. CASE STUDY – CALEA DOROBANȚILOR, BUCHAREST

ILIESCU A-F., IONESCU R., MANESCU C.R., DOBRESCU, E.

Keywords: green areas, trees species, diversity, vegetation assessment, pollution

ABSTRACT

Street plantation inventory, as a stage of management, allowed the uncovering of the deficiencies appeared during the years, the downgrading processes, aging and losses of the trees and the changes in the vegetal composition.
The preliminary study indicates the necessity of the analytical assessment of each sample in order to establish the necessary works for the invigoration.

INTRODUCTION

The green networks of the towns have important ecological functions which actually prevail over some other functions and that is the reason why their preservation and development based on some principles form one of the urban planning objectives.

In the urban green system, in the intensively built areas, the streets trees lines are often the only linking elements with the surfaces where the vegetation prevails (green stripes, squares, gardens, parks).

The street plantations are not only an aesthetic element of accompanying volumes and built surfaces, but they especially contribute to the improvement of the urban microclimate and the reduction of polluted atmosphere. They are usually made of deciduous trees able to respond some multiple requests of morphological, biological, physiological and landscape-utilitarian type.

The list of the species adequate to this use is quite narrow presently when their life conditions become worse and worse: because of the increasing traffic and the extension of asphalt and concrete surfaces, the physiological stress caused by pollution, the caloric radiation, dryness, unfavourable edaphically conditions is aggravated, which leads to sensitivity to diseases.

The modern technical solutions of installing new street plantations practiced in European countries diminish the discomfort of the trees; they can be applied in newly built districts for which the urban plan respects the European norms. The application of some adequate measures is necessary in case of old streets in order to improve the location conditions. A continuous monitoring of the trees state is also necessary.

Because the ecological function depends on trees repartition in territory and their age, size and health, a good management of all urban plantations and mainly street ones is imposed in order to assure their durability.

Worldwide there are models of long term management which emphasize the importance of sustainability (Clark and others-1977, Dwyer and others-2000, quoted by Harris and others-2004, Mailliet, L., Bourgery, C. - 2004). The main elements of these models are the improvement of trees inventory and assessment, adapted management programs, the improved dialogue and collaboration between public authorities, green industry, green spaces managers and local communities.

Study objective

The downgrading of Bucharest streets green patrimony is a present phenomenon to which, beside the above mentioned factors, also contributes the aging of many trees and the planting deficiencies, associated with a poor execution of street modernization works.

The evaluation of plantations state being obligatory stage in management program establishing, the present work had as objective the comparative study of trees species behaviour during a period of time, on Calea Dorobantilor in Bucharest, based on the preliminary general inventory, in order to supply necessary information for the next management stages.

MATERIAL AND METHOD

All the alignment trees on Calea Dorobanților, between Piața Lahovari and Piața Charles de Gaulle have been studied (Fig. 1).

Taking into consideration the plantations heterogeneity the inventory ”tree by tree” type was adopted, organized on three sections delimited by junctions:

I. Piața Lahovari – Şoseaua Ştefan cel Mare, with simple two-sided tree lines (Fig. 2);

II. Şoseaua Ştefan cel Mare – Piața Dorobanților, with simple two-sided tree lines (Fig. 3);

III. Piața Dorobanților – Piața Charles de Gaulle, cu with simple two-sided tree lines and double central tree lines(Fig. 4);.

To appreciate the quantitative and qualitative changes in the alignment plantations compared to the previous years we used data from works written in 1990 (I.C.A.S., Study of a contract with D.D.P. - responsible Eng. V. Cristescu) and in 2004 (USAMV Bucharest, Landscape Department - project contract with The Town Hall of District 1, coordinator Eng. F. Teodosiu)

The trees state of vegetation was appreciated on the basis of a methodology proposed by Mailliet, L., Bourgery, C., 2004, through the framing in 5 classes (table 1).

To appreciate the pollution effects on the vegetation state we took into consideration the conclusions of some agrochemical and physiological research, made by PhD candidate Cristina Mănescu in the plantations on Calea Dorobanților (2004-2006).

RESULTS AND DISCUSSIONS

1. Numeric assessment

From the analysis of the data presented in table 2 result the following aspects:

The total number of the tree species on Calea Dorobantilor is 15, from which 12 are in section I, 11 in section II and 9 in section III, which is the most homogenous.

In section I (Piața Lahovari – Şoseaua Ştefan cel Mare) prevail adult and old trees (83,2%) and the rejuvenation percentage is the smallest (13,1% young trees). Section III (Şoseaua Ştefan cel Mare – Piața Dorobanților) is also made from adult and old trees (81,6%) but the replantation percentage was bigger (17,2 % young trees). The dynamics of the modifications is remarked in section II (Piața Dorobanților – Piața Charles de Gaulle) where adult and old trees (66,9%) are followed by the young ones (21%) and middle aged ones (10,5%).

On the entire studied area, the tree ages are different. By species, *Quercus* has the highest number of adults and old trees, followed by *Fraxinus* and *Tilia*; in the category of young trees with a lower percentage is on the first place, followed by *Quercus* and *Tilia* (Fig. 5).

The 1990 registering and 2004 surveys of Calea Dorobantilor plantations offer information concerning occurred changes until 2007 (table 3). The data indicates the fact that between 1990-2004 clearings as well as replanting took place, still the total number of trees decreased. The replanting, reflected by the share of young trees, 17,2% from the entire street plantations in 2007 (table 2) led to the tree number exceeding compare with 1990 and 2004 years. The comparison of data registered on sections in 2004 and 2007 (table 3) shows the increase of replanting in this short period of time on section I and III; it results that section II, which has the highest percentage of young trees, was replanted during 1990-2004.

Vegetal composition of the entire way emphasized the dominance of *Fraxinus, Quercus* and *Tilia* (Fig. 6), with some diferences: in section I *Fraxinus excelsior* is the dominant species and *Ulmus carpinifolia* – subdominant (Fig. 7), in section II *Tilia x hybrida* is dominant and *Fraxinus excelsior* subdominant (Fig. 8), in section III *Quercus rubra* is dominant and *Fraxinus excelsior* subdominant (Fig. 9).

Through the comparative study of different species percentages in 1990 and 2007 (table 4, total columns) we see the increasing of *Fraxinus* and *Quercus*, the maintenance at similar shares of *Acer negundo, Platanus hybrida* and *Acer platanoides* species, the rest of the species present in both sections is decreasing, more important for *Tilia* and *Ulmus.* The restriction of their use is due to some deficiencies: at lime tree - the suckering, and at elm tree - the drying caused by graphiosis (*Ophiostoma ulmi*).

2. The vegetation state

The data registered in 2007 is presented in comparison with the data in 1990 (table 4) on the 5 classes (A - E) of framing of trees (very good state, medium, weak, in irreversible decline, dead tree) no matter the age.

The global situation indicates the regress of the vegetation state: the decreasing of the class A share and the increasing of classes B and C. The lower percentages of classes D and E in 2007 is explained through the clearings of dry trees and in irreversible decline after 1990 followed by replanting.

Comparing the framing of the species in vegetation state classes, we notice the superiority of the plane trees with higher percentages in classes A and B and the lack of classifications in D and E. Two species, *Tilia argentea* followed by *Quercus rubra,* have also important shares in classes A and B, but contain also weaker trees (C) and in decline (D) which indicates the progressive decreasing of the physical state comparing to 1990. This tendency is more emphasized at *Ulmus, Fraxinus, Tilia x hybrida,* having trees framed in all classes. In 2007 the highest death rate percentage (class E) was registred at *Ulmus* and in 1990 at *Tilia hibrida* with a record of 26,2%(Fig. 10). We can mention that the general statistics does not indicate the causes of mortality which can be the health state as well as the losses that appear at planting (the weak quality of the trees and execution works, the poor maintenance)(Fig. 11).

To appreciate the pollution effects on the vegetation state we took into consideration the conclusions of some agrochemical and physiological research, made by PhD candidate Cristina Mănescu in the plantations on Calea Dorobanților (2005-2006), which show the fact that the progressive depreciation of the physical state of trees is influenced by the pollution caused by the street traffic.

The content of heavy metals in the soil samples taken from the plantations on Calea Dorobantilor exceeded 5-6 times the maximum limit (Lăcătuşu and co, 1987) for lead and cadmium. A big content of heavy metals in the soil determines an inhibition of the roots growing and the destruction of micro flora and micro fauna of the soil, with negative effect on plant nutrition.

The data obtained through the analysis of leaf samples showed differences in lead content, 1,51 times higher at *Tilia* street samples and 1,57 times at *Acer* compared to the samples taken from Herastrau Park.

At some species, the leafy surface suffered modifications because of the heavy metals accumulations (*Acer negundo, Tilia argentea*).

On Calea Dorobantilor, the big sulphur content of tree leaves determined negative effects on potassium nutrition at *Acer*.

Also, the tree leaves had a higher content of dry substance than normal, since July, because of the stress conditions caused by pollution, the caloric radiation of the pavements, the low humidity and the air currents, which determine the decreasing of leaves turgor and the early senescence. These phenomena lead to the trees debilitation, because the vegetation period is shortened, the plants being not enough prepared for the cold period of the year.

CONCLUSIONS

1. The plantations on Calea Dorobantilor are characterized by the heterogeneity of the tree species, their age and state, imposing the registration of each tree on a survey plan.
2. The heterogeneity of the plantations is caused by the completion of losses with trees available from other species and it is not the result of a coherent planning of replacing the species with some behavioral deficiencies (sections I and II).
3. The rejuvenation of the plantation was realized on a bigger scale on section II (Şos. Ştefan cel Mare – Piaţa Dorobanţi), a commercial area, where many construction works were executed and determining the replacement of affected trees.
4. The physical state of trees during the years is continuously decreasing, mainly at *Ulmus, Fraxinus, Tilia hybrida*.
5. The mortality registered in 1990 and 2007 indicated the species that do not behave well in the conditions on Calea Dorobanţilor: *Acer platanoides, Tilia hybrida, Ulmus carpinifolia.*
6. The lead and sulphur pollution affect the trees on Calea Dorobanţilor, leading to the decreasing of their vitality.
7. The preliminary evaluation indicates the necessity of the analytical assessment of each tree in order to establish the works necessary for their invigoration.

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Tables

Table 1. Vegetation state of street plantation trees.

Class	Vegetation State	Description	Interventions for the next 10 years
A	Very good	Healthy, vigorous trees	No intervention or normal maintenance
B	Medium	Healthy, vigorous trees. Few dry wood and healing wounds in canopy. Absence of pests and cryptogrammic attacks.	No intervention or normal maintenance
C	Weak	Trees with slightly affected vigor. Unhealed wounds or chronic or severe parasite attacks. Dry wood in canopy limited in its periphery.	Necessary sanitary interventions. Possible measures of preservation.
D	In irreversible decline	Trees in irreversible drying process. Important wounds or hollows, parasite fungi on the trunk or unhealed wounds. High percentage of dry wood in canopy. Irreversible damage. Potentially dangerous.	Dry branches removing interventions. Clearing in the next years.
E	Dead	Dry trees. Dangerous.	Immediate clearing.

Table 2. Numeric inventory of street trees species on Calea Dorobantilor Bucuresti – 2007

Nr. crt.	Species	Number and tree age on street sections															Total number by ages				Total nr. by species
		I					II					III									
		a	m	t	p	total	a	m	t	p	total	a	m	t	p	total	a	m	t	p	
1	Aesculus hipp.	9				9											9				**9**
2	Acer campestre											1				1	1				**1**
3	Acer negundo	1				1	7				7	26				26	34				**34**
4	Acer platanoides	1				1	3				3	6				6	10				**10**
5	Catalpa bign.	1				1	1				1						2				**2**
6	Fraxinus excelsior	28	3	12		43	5	3	14		22	55	1	18		74	88	7	44		**139**
7	Fraxinus ex. Aurea									2	2									2	**2**
8	Platanus x hybrida	18				18									1	1				1	**19**
9	Quercus rubra							1	3		4	105	1	24		130	105	2	27		**134**
10	Robinia pseud.			2		2			5		5								7		**7**
11	Tilia argentea	3				3	7				7						10				**10**
12	Tilia cordata	3				3	16	7	2		25	4				4	23	7	22		**32**
13	Tilia x hybrida	1	1			2	40	2	2		44	2				2	43	3			**48**
14	Ulmus carpinifolia	20				20						1				1	21				**21**
15	Ulmus glabra	4				4	4				4						8				**8**
Total		**89**	**4**	**14**		**107**	**83**	**13**	**26**	**2**	**124**	**200**	**2**	**42**	**1**	**245**	**316**	**19**	**82**	**3**	**476**
% on street sections		**83,2**	**3,7**	**13,1**		**100**	**66,9**	**10,5**	**21,0**	**1,6**	**100**	**81,6**	**0,8**	**17,2**	**0,4**	**100**	**66,3**	**3,9**	**17,2**	**0,6**	**100**

a - adult and old trees, m- medium age trees, t -young trees, p -untrained young trees recently planted

Table 3. Numeric evolution of street trees on Calea Dorobantilor (1990 - 2007)

Year	Total trees number	Section I		Section II		Section III	
		Number	Diference %	Number	Diference %	Number	Diference %
1990	441						
2004	420	93		113		214	
2007	476	107	13,1	124	8,9	245	12,7

Table 4. The vegetation state of trees in 2007 compare with 1990

Nr. crt.	Species	Year	Vegetation state classes										Total trees	
			A		B		C		D		E			
			nr.	%	nr.	%	nr.	%	nr.	%	nr.	%	nr.	%
1	Aesculus hippocastanum	1990	5	33,3	1	6,7	8	53,3			1	6,7	15	**3,4**
		2007			5	55,5	4	44,5					9	**1,9**
2	Acer campestre	1990												
		2007							1	100			1	**0,2**
3	Acer negundo	1990	1	2,9	26	76,5	7	20,6					34	**7,7**
		2007	3	8,9	10	29,4	8	23,5	12	35,2			34	**7,1**
4	Acer platanoides	1990	4	40,0	1	10,0	3	30,0			2	20,0	10	**2,2**
		2007	1	10,0	4	40,0	5	50,0					10	**2,1**
5	Catalpa bignonioides	1990					3	100					3	**0,7**
		2007					2	100					2	**0,4**
6	Fraxinus excelsior	1990	43	57,4	1	1,3	25	33,3			6	8,0	75	**17,0**
		2007	29	20,9	51	36,7	45	32,4	11	7,9	3	2,1	139	**31,5**
7	Fraxinus excelsior Aurea	1990												
		2007	2	100									2	**0,4**
8	Platanus x hybrida	1990	13	72,2			5	27,8					18	**4,1**
		2007	9	47,4	6	31,6	4	21,0					19	**4,0**
9	Quercus rubra	1990	36	52,2	5	7,2	17	24,6	1	1,5	10	14,5	69	**15,6**
		2007	44	32,8	55	41,0	30	22,5	5	3,7			134	**28,1**
10	Robinia pseudacacia	1990									1	100	1	**0,2**
		2007	6	85,7	1	14,3							7	**1,5**
11	Tilia argentea	1990	39	52,0	20	26,7	6	8,0	4	5,3	6	8,0	75	**17,0**
		2007	5	50,0	4	40,0	1	10,0					10	**2,1**
12	Tilia cordata	1990												
		2007	6	18,8	16	50,0	9	28,1	1	3,1			32	**6,7**
13	Tilia x hybrida	1990	2	3,3	30	49,2	11	18,0	2	3,3	16	26,2	61	**13,8**
		2007	6	12,5	21	43,7	19	39,6	1	2,1	1	2,1	48	**10,1**
14	Ulmus carpinifolia	1990	33	45,8			23	32,0	7	9,7	9	12,5	72	**16,3**
		2007	6	28,6	5	23,8	6	28,6	1	4,7	3	14,3	21	**4,4**
15	Ulmus glabra	1990												
		2007	4	50,0	2	25,0	1	12,5	1	12,5			8	**1,6**
Total		**1990**	**181**	**41,0**	**80**	**18,1**	**91**	**20,6**	**36**	**8,2**	**53**	**12,1**	**441**	**100**
		2007	**121**	**25,4**	**180**	**37,8**	**134**	**28,2**	**33**	**6,9**	**8**	**1,7**	**476**	**100**

Figures

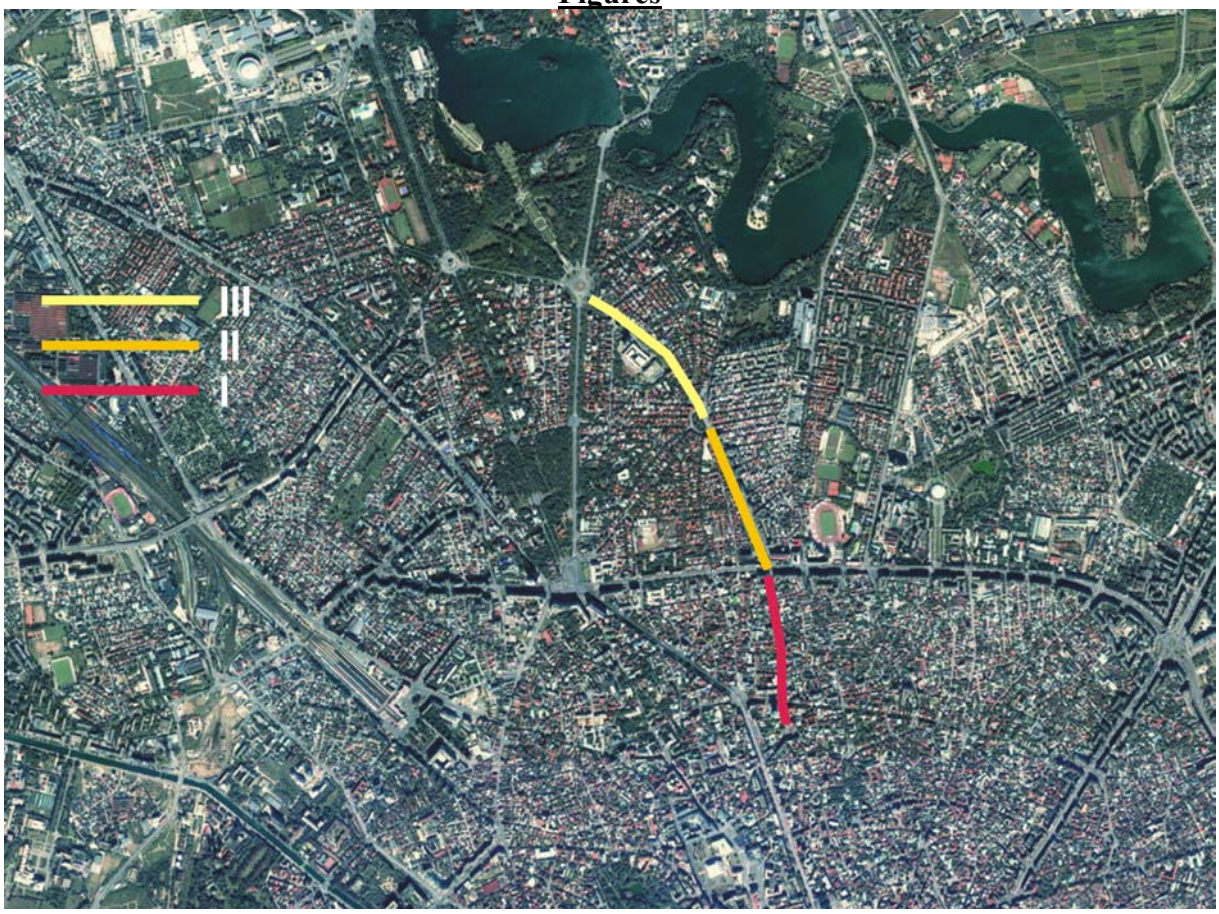

Fig. 1 Calea Dorobantilor, Bucuresti – the studied sections I, II, III.

Fig. 2 Calea Dorobanților – section I, mixed tree composition.

Fig. 3 Calea Dorobanților – section II, trees of different ages.

Fig. 4 Calea Dorobanților – section III, four street tree lines.

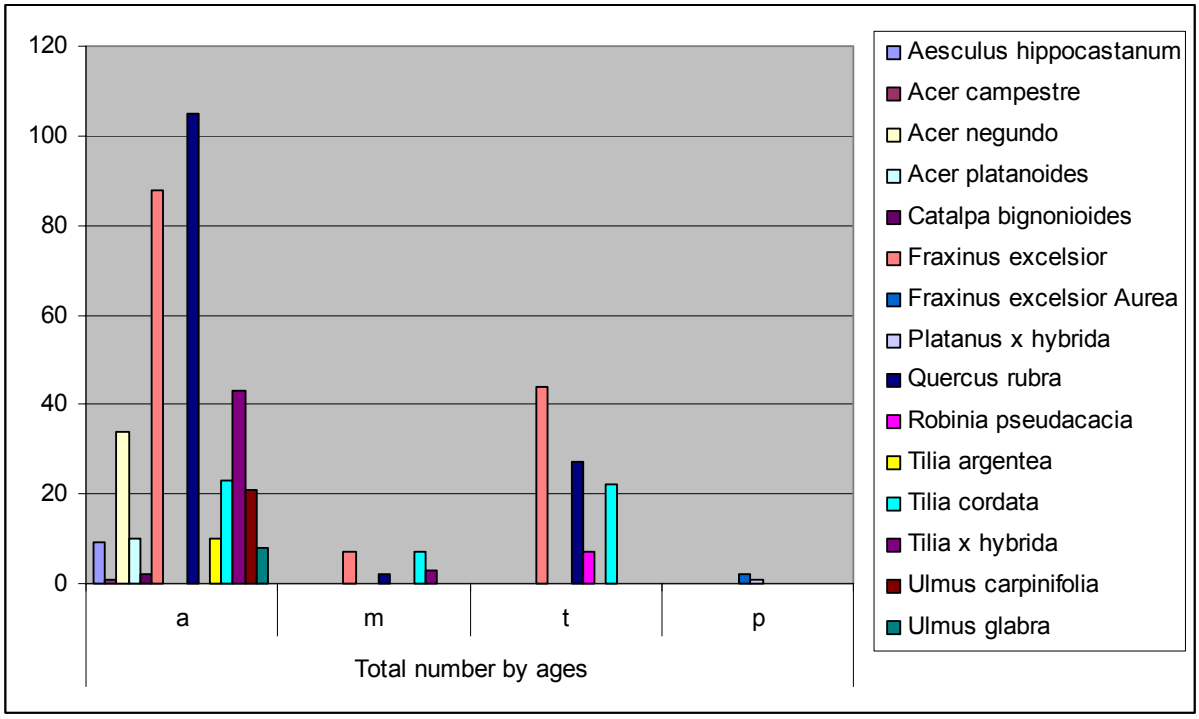

Fig. 5 Categories of tree ages in 2007.

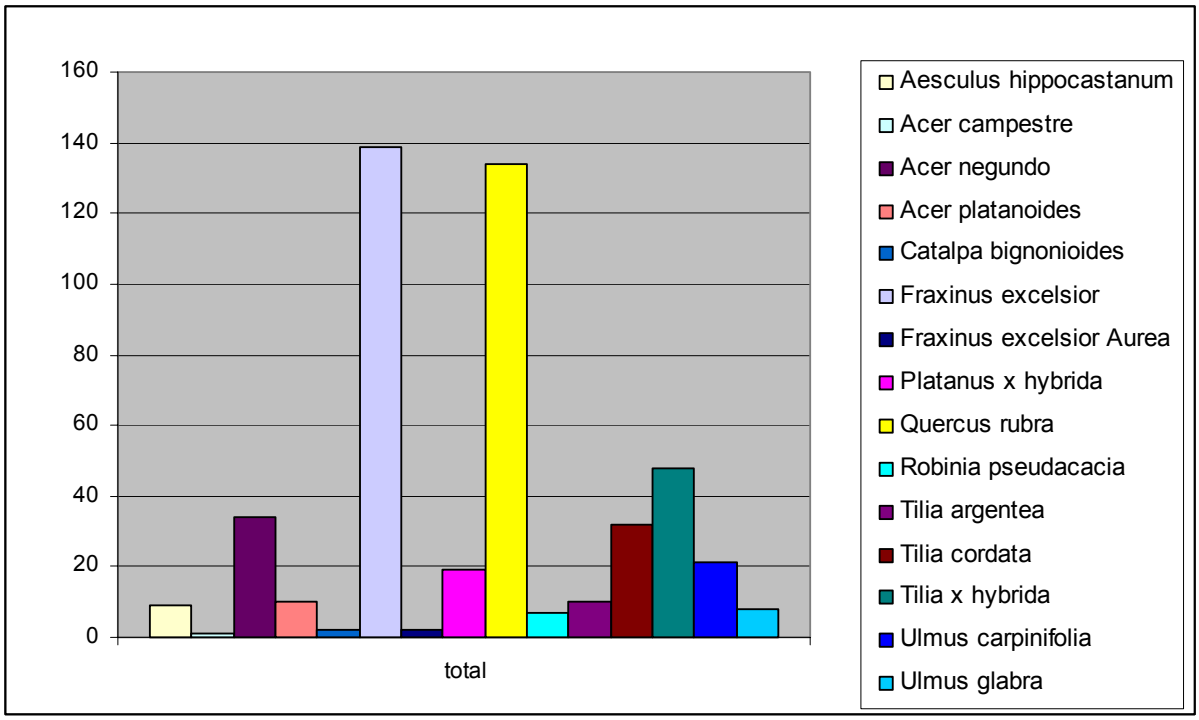

Fig. 6 Distribution of species on entire studied area (2007).

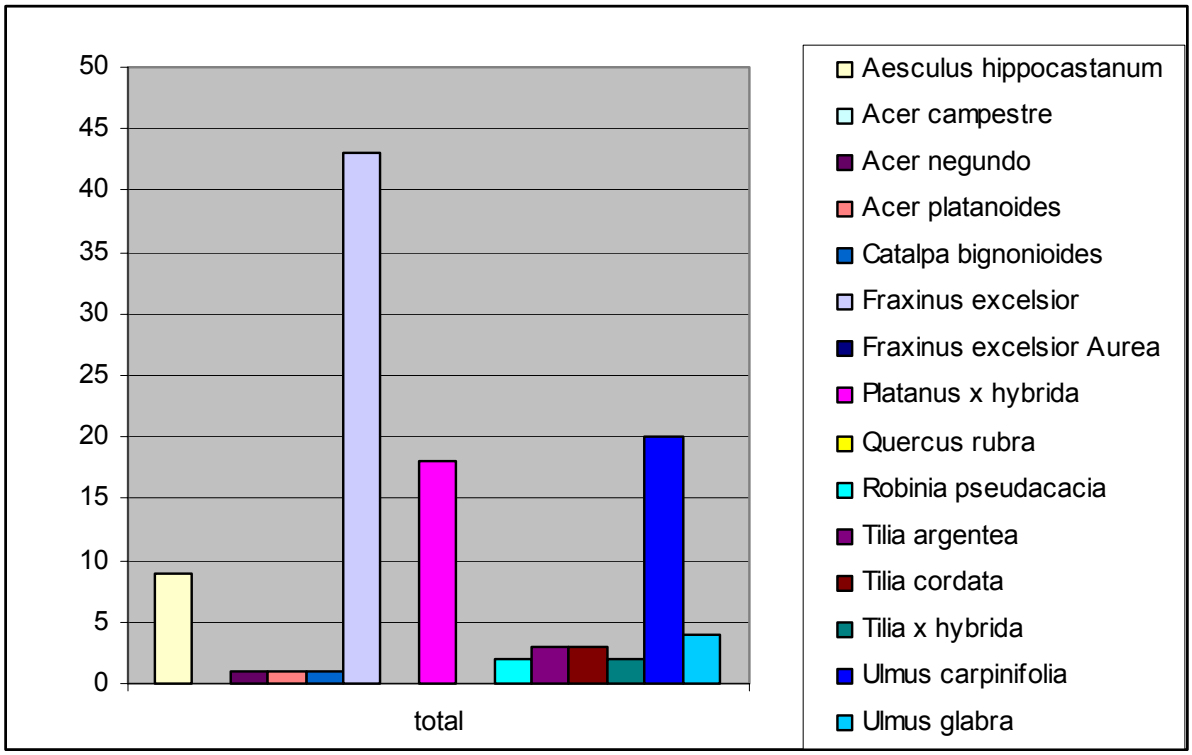

Fig. 7 Distribution of species on first section (2007).

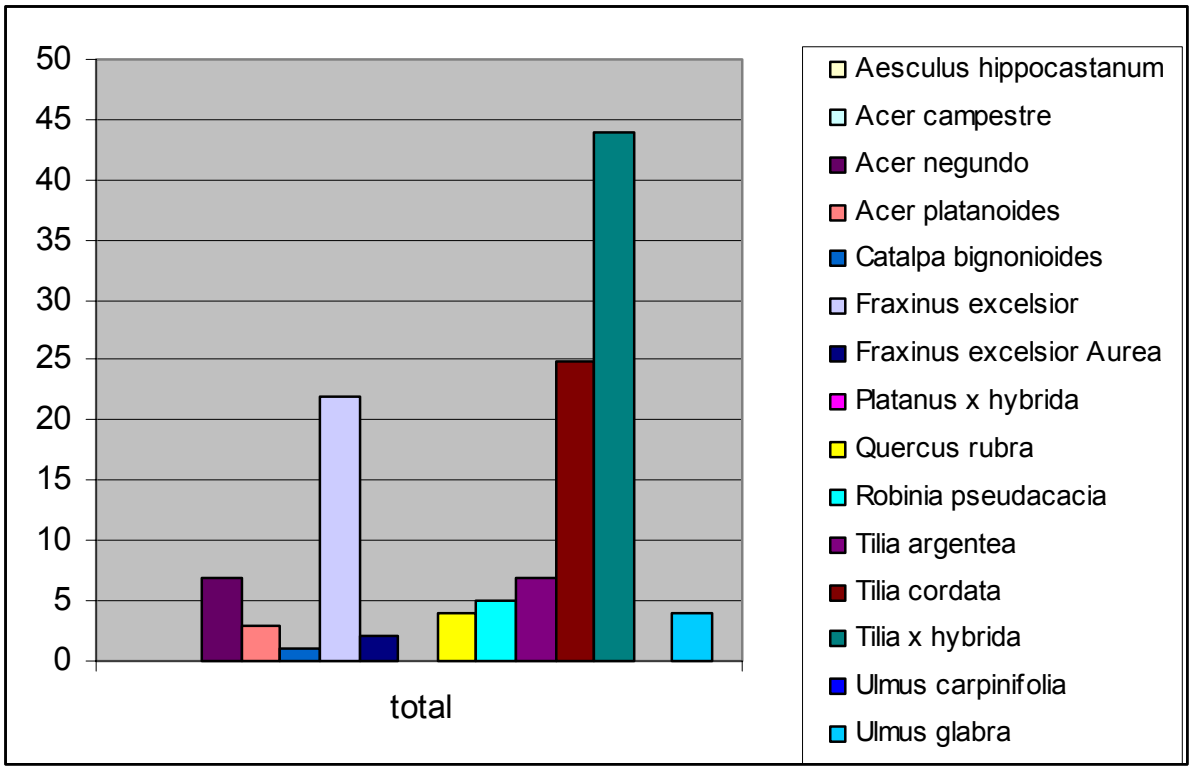

Fig. 8 Distribution of species on second section (2007).

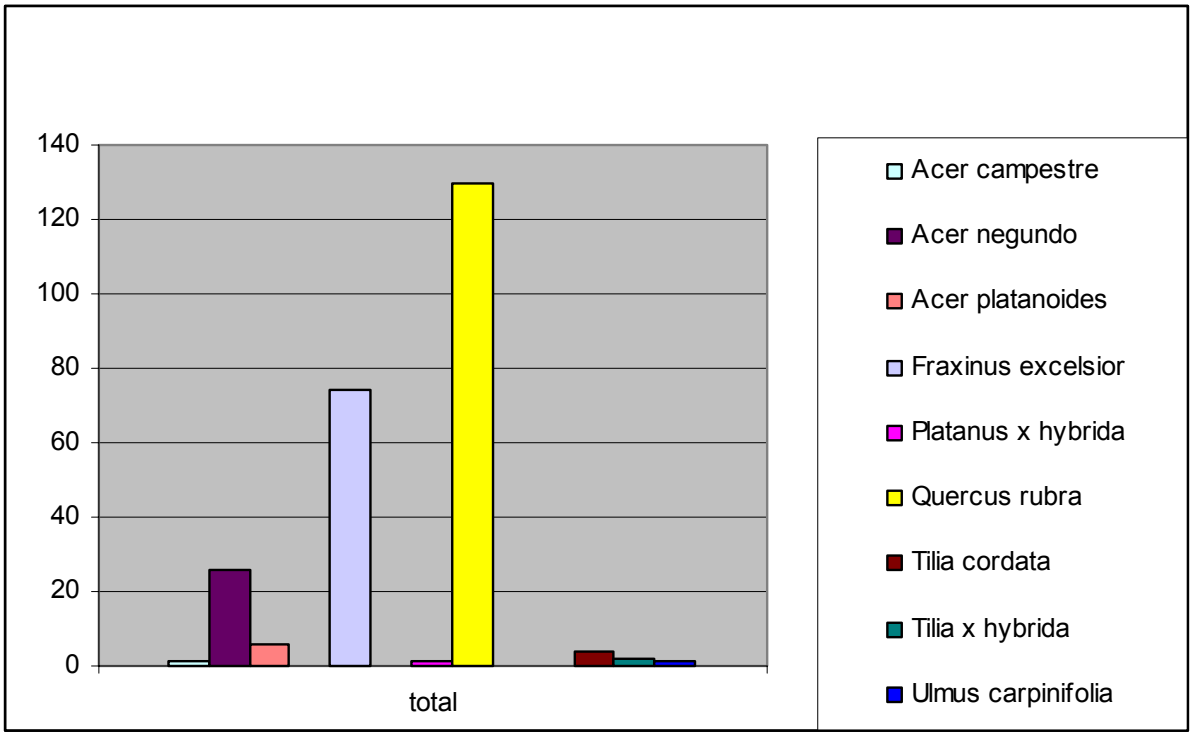

Fig. 9 Distribution of species on third section (2007).

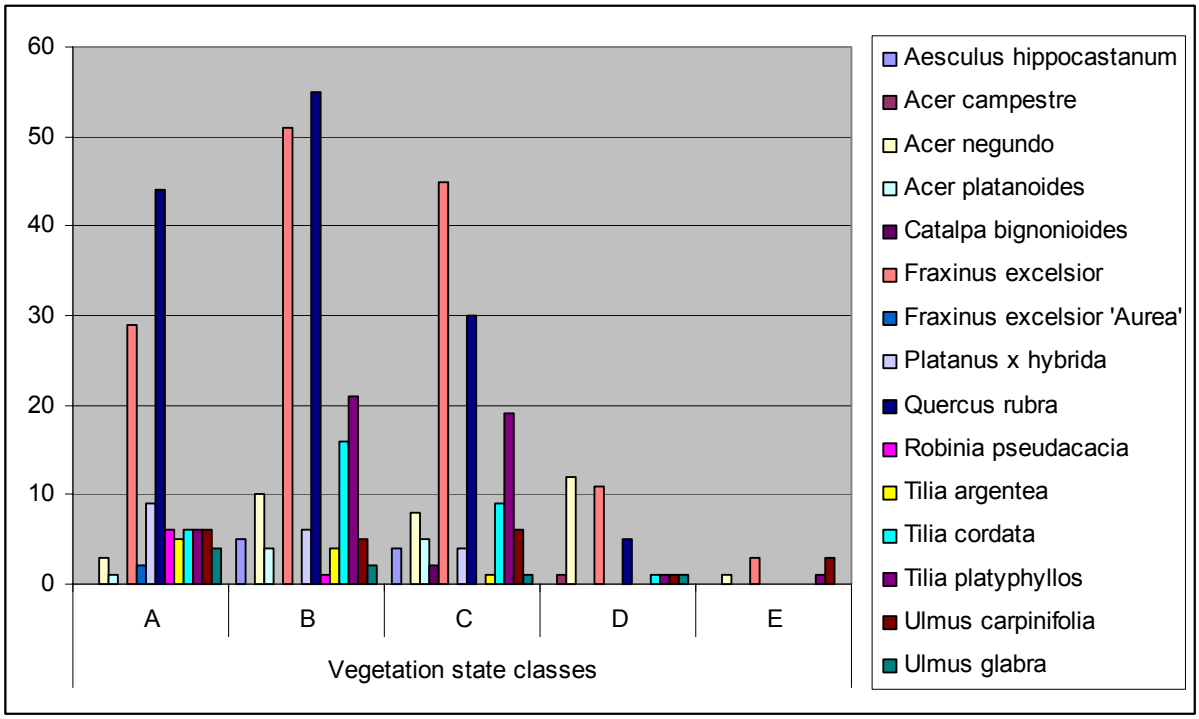

Fig. 10 Vegetation state classes by species in 2007.

A

B.

C.

D.

E.

Fig. 11 Different vegetation classes - 2007 (A.–*Quercus* cl. A; B.–*Platanus* cl. C and B; C.– *Fraxinus* cl. C; D –*Fraxinus* cl. D; E.– *Fraxinus* cl. E).

Lucrări ştiinţifice U.Ş.M.A.V.B., Seria B, Vol. L, 2007

THE ABILITY OF SOME WOODY SPECIES TO REMOVE NITROGEN AND SULPHUR FROM POLLUTED AIR

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Keywords: broadleaves species, conifers, street plantations, nitrogen oxides, sulphur oxides

ABSTRACT

In urban areas, motor vehicles are usually the major source of air pollution with both nitrogen and sulphur oxides. In the present work the ability of some woody ornamental species to reduce the urban pollution with NOx and SOx was investigated. For this goal, leaves samples from plants located in two sites with different level of air pollution were compared for their content in nitrogen and sulphur. The results showed that species have different abilities to remove the nitrogen and sulphur from the polluted atmosphere.

INTRODUCTION

Nitrogen oxides and sulphur oxides seriously affect the general health of urban population and increasing the occurrence of respiratory ills. In Bucharest, 70% from the air pollution is determined by vehicles emissions. Woody vegetation act like a filter reducing the air pollution, intercepting and removing by particles and gaseous pollutants. The ability of some woody species to diminish the air pollution with NOx and SOx, by foliage retention was evaluated in the present paper. Nitrogen and sulphur contents into the leaves collected from plants exposed to different level of air pollution were determined. Also, foliage aspect, the leaves surface area and the leaves dry matter content were analysed in order to establish the impact of these pollutants on plants.

MATERIALS AND METHODS

The research was initiated in 2005, when plants from seven woody ornamental species - *Acer negundo*, *Prunus cerasifera*, *Tilia tomentosa*, *Philadelphus coronarius*, *Symphoricarpos albus*, *Pinus nigra* and *Thuja orientalis* - were selected and marked in two sites with different load of pollutants – Calea Dorobantilor and Herastrau Park. Plant samples were collected and analyzed at three critical stages of plants – beginning of vegetation (May), full growth (July) and at the end of vegetation (September). At each site all plant samples were collected from the same plants, from the median part of the shoots.

Unmetabolized forms of nitrogen was extracted with acetic acid 2% (Davidescu et al., 1984), and expressed in ppm. The total form of nitrogen in leaves was determined after the digestion in sulfuric acid and hydrogen peroxide of 0.2 g of dry plant following the methods described by Davidescu et al. (1984). Sulphur content in leaves was analysed following the mineralization of 1g plant material (ICPA method) and expressed in ppm. The leaves total surface area and the soluble solids were determined.

RESULTS AND DISCUSSIONS

Comparing the results of the two sites (fig.1), it can be observed that all the leaves samples collected from broadleaves species presented higher values of unmetabolized nitrogen at the polluted site (Calea Dorobantilor). The maximum values were recorded in

September, excepting *Philadelphus* (with higher values in July). Normally, the content of leaves in unmetabolized nitrogen decrease in autumn as a result of its metabolisation in organic compounds.

The results showed a similar evolution during vegetation period of total nitrogen in leaves collected from the two sites (fig. 2). The highest content of total nitrogen was determined in September into the *Philadelphus* leaves – 3,71 %. Total nitrogen was very small in *Prunus* leaves (1,74%) collected in September from plants located in Calea Dorobantilor, although the plants from the street plantation presented the biggest values of unmetabolized nitrogen in the same period. This observation was also done for *Tilia*. The presence of a high concentration of unmetabolized nitrogen in leaves was explained by the severe pollution with nitrogen oxides into the area. Furthermore, the nitrogen oxides induced the ozone formation - an extremely phytotoxical product - of which presence was remarked as specific symptoms on the sensitive plants (*Pinus* and *Prunus*).

The air pollution in Calea Dorobantilor had also an impact on the leaves content in sulphur (fig. 3). Agrochemical analysis proved that all the seven species contained more sulphur in leaves at the street plants comparing with that from park.

Sulphur was found in high concentration into the leaves collected from Calea Dorobantilor at: *Acer negundo* – 2255 ppm, *Symphoricarpos albus* – 2225 ppm and *Tilia tomentosa* – 2082 ppm. In Herastrau Park the biggest values of sulphur in leaves were recorded at *Symphoricarpos* – 2078 ppm, *Acer* – 1912 ppm and *Prunus* – 1910 ppm. We observed that sulphur was more retained in May and July, when the air humidity was raised by the frequent precipitations during this period. It is known that sulphur dioxide enter more easily into the leaves tissues when the air humidity is high (Smith, 1990).

In Calea Dorobantilor the smallest content of sulphur in leaves was observed at *Pinus* – 1238 ppm and *Thuja* - 1600 ppm. For conifers, a concentration of 1300 ppm into the leaves is considered phytotoxical (Molski, 1990). Although the pine needles collected from the plants located in Calea Dorobantilor contained less then 1300 ppm sulphur, symptoms of SOx pollution (needles damage) were detected even in July.

The impact of NOx and SOx on the leaves surface area and the dry matter content was studied using correlations (table 1). A higher content of nitrogen in leaves induced a significant reduction of leaves surface in *Prunus cerasifera*, *Thuja orientalis* and *Symphoricarpos albus*. Statistical data showed also that the excess suphur in leaves contributed to a smaller foliage at *Philadelphus coronarius*, *Symphoricarpos albus* and *Acer negundo.*

Significant negative correlations between the nitrogen content in leaves and their dry matter content was established only for *Thuja*. For *Tilia* and *Thuja* we found significant positive correlations between the sulphur content in leaves and their dry matter content.

CONCLUSIONS

The presence of NOx into the Calea Dorobantilor area, as a result of vehicle exhaust changed the nitrogen metabolism into the leaves of all seven species studied. The unmetabolized nitrogen in leaves remained also at a high level in September, although the values were expected to diminish due to its metabolization in organic compounds.

The high nitrogen content into the leaves of Prunus cerasifera, Thuja orientalis and Symphoricarpos albus reduced their surface area, these two indicators being very significant correlated.

Agrochemical analysis showed bigger values of sulphur into the leaves of the seven species growing into street plantations near to Calea Dorobantilor. The highest concentrations

of Sulphur in leaves were determined at *Acer negundo* – 2255 ppm, *Symphoricarpos albus* – 2225 ppm and *Tilia tomentosa* – 2082 ppm.

Conifer species retained less Sulphur for air than broadleaves species (the maximal values recorded in September - 1238 ppm at *Pinus* and 1600 ppm at *Thuja*). Although the *Pinus* needles contained the smallest amount of sulphur comparing with the other species, we observed symptoms of sulphur oxides injuries even in July.

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Table 1. Statistical correlation among nitrogen and sulphur content in leaves and leaf surface area and dry matter content

Correlations		Species						
		Acer	**Prunus**	**Tilia**	**Philad.**	**Symph.**	**Pinus**	**Thuja**
Nt	L.s.a.	0,6952	-0,8732**	-0,5776	-0,4331	-0,8048*	-0,2026	-0,8764**
	D.m.c.	-0,4951	-0,4591	0,1024	0,5228	-0,4469	0,1209	-0,8628**
S	L.s.a.	-0,7975*	-0,5654	0,5278	-0,8758**	-0,8920**	0,5850	0,1270
	D.m.c.	-0,0676	-0,5100	0,7902*	0,3658	0,3689	0,4923	0,7385*

L.s.a. – Leaf surface area
D.m.c. - Dry matter content
* P< 0.05; ** P< 0.01; *** P< 0.001

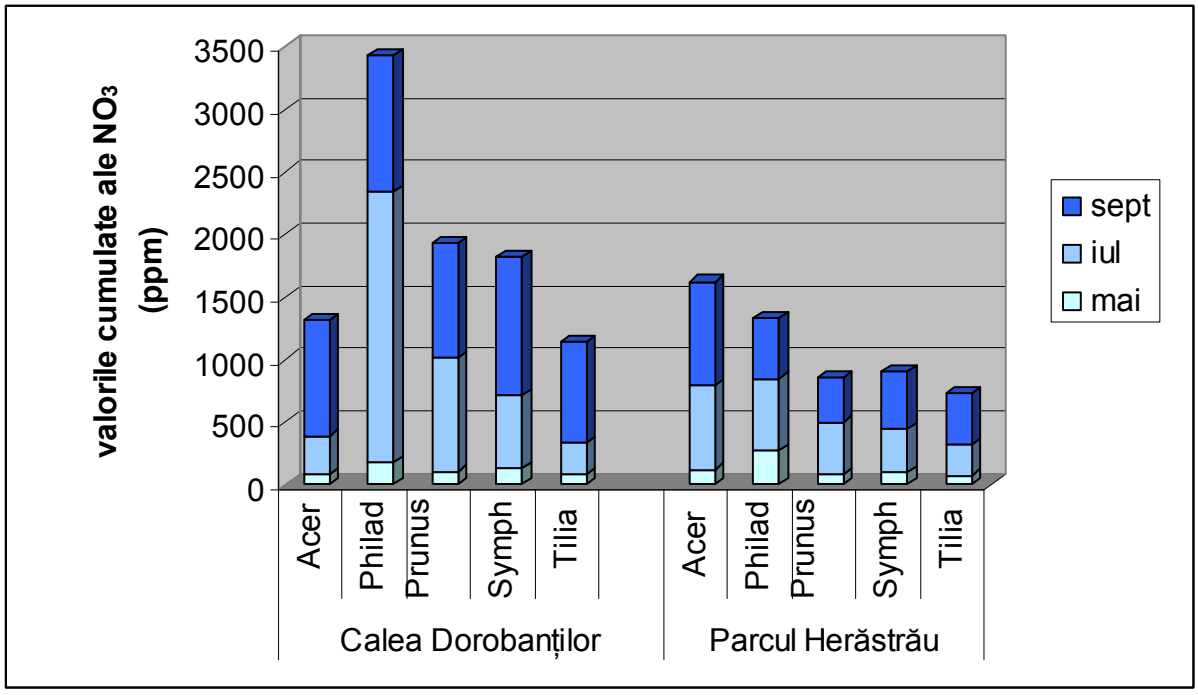

Fig. 1. Comparison between unmetabolized nitrogen values into the leaves

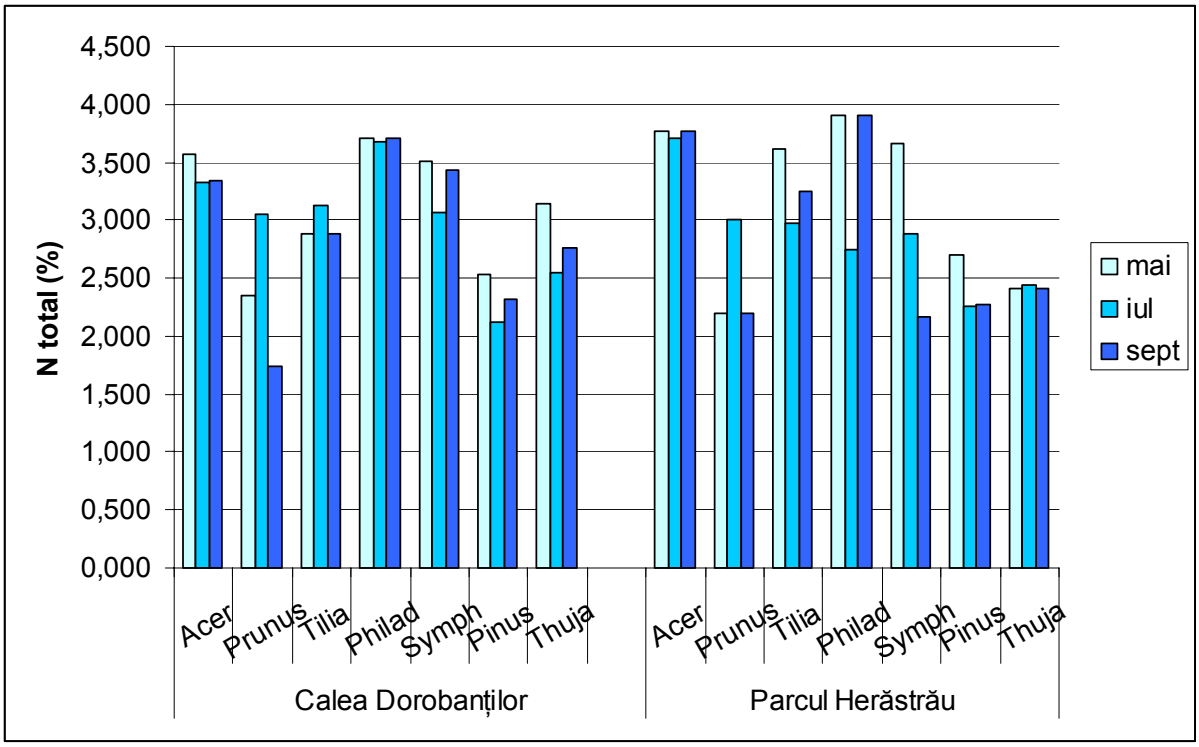

Fig. 2. Total nitrogen content in leaves

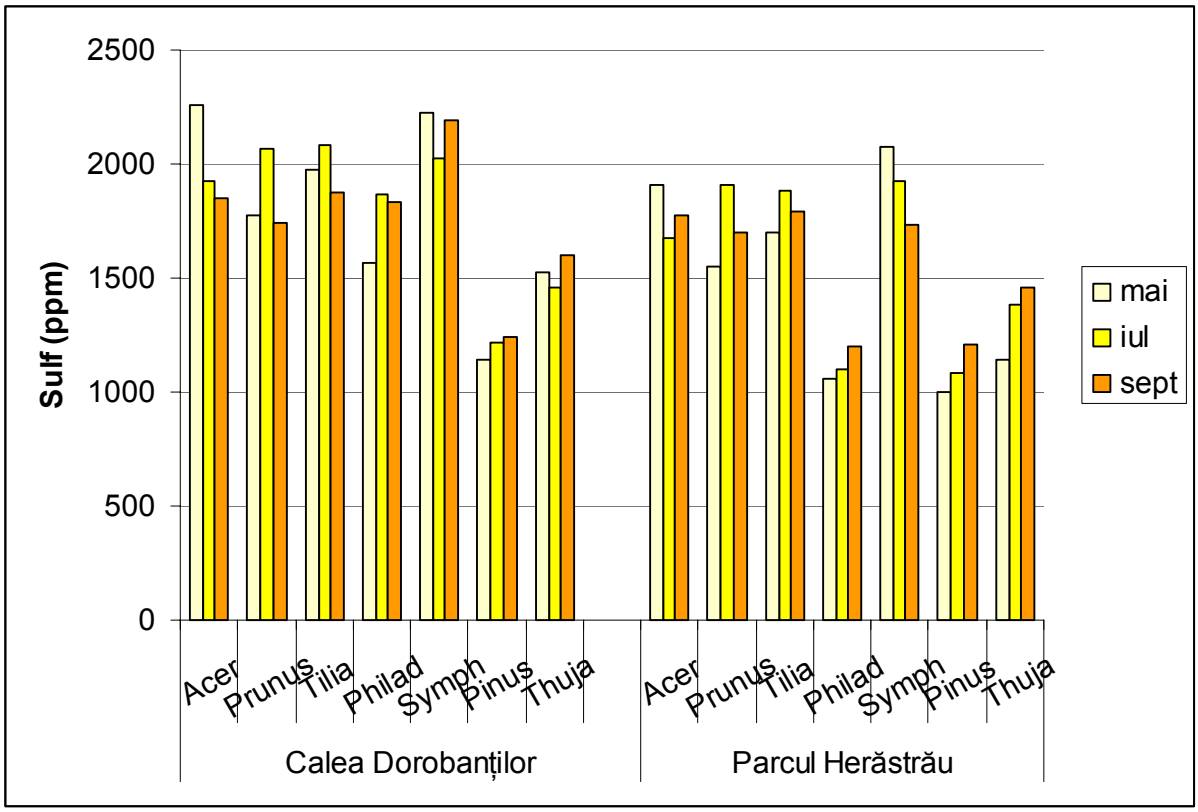

Fig. 3. Sulphur content in leaves.

Lucrări ştiinţifice U.Ş.M.A.V.B., Seria B, Vol. L, 2007

RESEARCH REGARDING THE GROWTH AND THE FLOWERING OF *ECHINACEA PURPUREA* MOENCH (*COMPOSITAE*) DEPENDING ON SOWING DATE AND PLACE

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ABSTRACT

The researches have been sustained in the field of U.S.A.M.V. Bucharest in the period 2004-2006, having the main purpose to find the most adequate propagation method and the best sowing time for the *Echinacea* plants. The used propagation methods of *Echinacea* were direct sowing in the field and seedlings production.

MATERIALS AND METHODS

This experiment was established in 2004 in the experimental field of U.S.A.M.V. Bucharest and it included 6 experimental variants (Table1). The experimental factors were the sowing date in field and greenhouse (for seedlings production) and the in field planting date for the seedlings. The seeds used for setting up the cultivation were imported from Hungary. According to the proposed experimental program were used 2 sowing methods: directly in the field on May 13 and 28, 2004 and in greenhouse on March 25 and April 8 and 22, 2004.

The distance between plants was 50/30 cm for all variants. For the direct seeding in field variants were sowed 3 seeds/nest and after the emergence was made the thinning operation, remaining only 1 plant/nest.

The others 4 variants were sowed in greenhouse for seedlings productions. For the greenhouse seedlings was used a mixture made of heavy soil and leaves soil in the proportion of 1:3. The springing period was between 11-24 days for the seedlings variants. The emergence percentage was between 47-78%, depending on sowing date. The pricking out was made in plastic pots with the diameter of 9 cm. For the pots were used a mixture made of heavy soil and leaves soil in the proportion of 1:2. There was tipped the root for the ramification. Were known that *Echinacea* had a taproot. The maintenance works used were specifically for flower seedlings productions. For setting out the culture using the seedlings were used seedlings with the age between 24 days (V3) and 39 days (V6). The planting begun on May 13 at V3 and ended on June 25 at V6.

During all the vegetation and blooming period were applied the general maintenance works: the hoeing, the weeding, the irrigation and if was necessary the tying.

RESULTS AND DISCUSSIONS

Regarding the height growing of the plants depending on the age were observed big differences between the 3 culture years. The biggest growth were realised in the second year and a smaller growth during the third year. The plants obtained with seedlings grew with 13,9% towards the experience average comparing with the planted obtained sowed directly in field. At the last plants were obtained growth values smaller than average with 9,28 (Table 3).

If during the first culture year (2004) *Echinacea purpurea* Moench had a relative reduced capacity of stem growing (with the biggest growth of 1.36 cm over the average), during the second and the third year were observed significant growth with 5.43 cm over the average.

The number of the inflorescence/plant was relatively reduced in the first year, *Echinacea purpurea* Moench having the biggest number of the inflorescences 8 inflorescences/plant (Table 2).

The situation is radically changing radical in the second and the third year when were registered values of 45 inflorescences/plant.

CONCLUSIONS

Based on observations and measurements made during the three research year we can conclude the followings:

- The variants setting up directly sowing in field after the seedlings producing date had smaller values regarding the height growth, shooting capacity, leaves number on lateral ramifications also the number of inflorescences/plant.
- Among the variants establishes with seedlings productions V3 had the highest values of: stem/plant number, secondary shoots number, leaves number on lateral ramifications also the number of inflorescences/plant and their diameter. We notice that this variant was set up previously the other variants, pointing out the importance of an early date for setting up the *Echinacea* culture for a better growth and plant blooming.

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Different stages of inflorescences evolution at *Echinacea purpurea* Moench

Fig. 1. The aspects regarding *Echinacea purpurea* Moench culture obtained with seedlings and the maximal blooming period in field culture

Table 1

Experimental variants

Variant	Sowing date	The seedlings age	The planting age
V1	13.05.2004	-	-
V2	28.05.2004	-	-
V3	25.03.2004	24	13.05.2004
V4	25.03.2004	39	28.05.2004
V5	08.04.2004	39	11.06.2004
V6	22.04.2004	39	25.06.2004

Table 2

The Dynamics of the Growing and the Blooming of *Echinacea*

Variant	Plant height (cm)			No. stems /plant			No. inflorescences		
	2004	2005	20006	2004	2005	2006	2004	2005	2006
V1	57,13	132.00	119.30	1.00	8.60	12.20	3.00	33.0	34.5
V2	42.86	136.00	102.50	2.14	10.30	10.30	6.20	41.0	28.2
V3	51.01	143.40	111.00	2.14	15.40	10.90	7.20	51.0	36.4
V4	58.15	139.90	121.50	3.50	10.80	8.50	8.00	45.0	32.1
V5	57.57	155.20	105.40	1.00	12.80	17.20	6.00	37.0	40.5
V6	87.10	141.20	119.00	1.25	10.40	11.50	5.50	35.0	31.4
Average	58.80	141.28	113.12	1.84	11.38	11.77	6.58	40.33	33.85

Table 3

Differences towards the average

Variant	Plant height (cm)			No. stems /plant			No. inflorescences		
	2004	2005	2006	2004	2005	2006	2004	2005	2006
V1	-1.67	-9.28	+6.18	-0.84	-2.78	+0.43	-3.58	-7.33	+0.65
V2	-15.94	-5.28	-10.62	+0.30	-1.08	-1.47	-0.38	+0.67	-5.65
V3	-7.79	+2.12	-2.12	+0.30	+4.02	-0.87	+0.62	+10.67	+2.55
V4	-0.65	-1.38	+8.38	+1.66	-0.58	-3.27	+1.42	+4.67	-1.75
V5	-1.23	+13.9	-7.72	-0.84	+1.42	+5.43	-0.58	-3.33	+6.67
V6	+28.3	-0.08	+5.88	-0.59	-0.98	-0.27	+1.08	-5.33	-2.45

Fig. 2

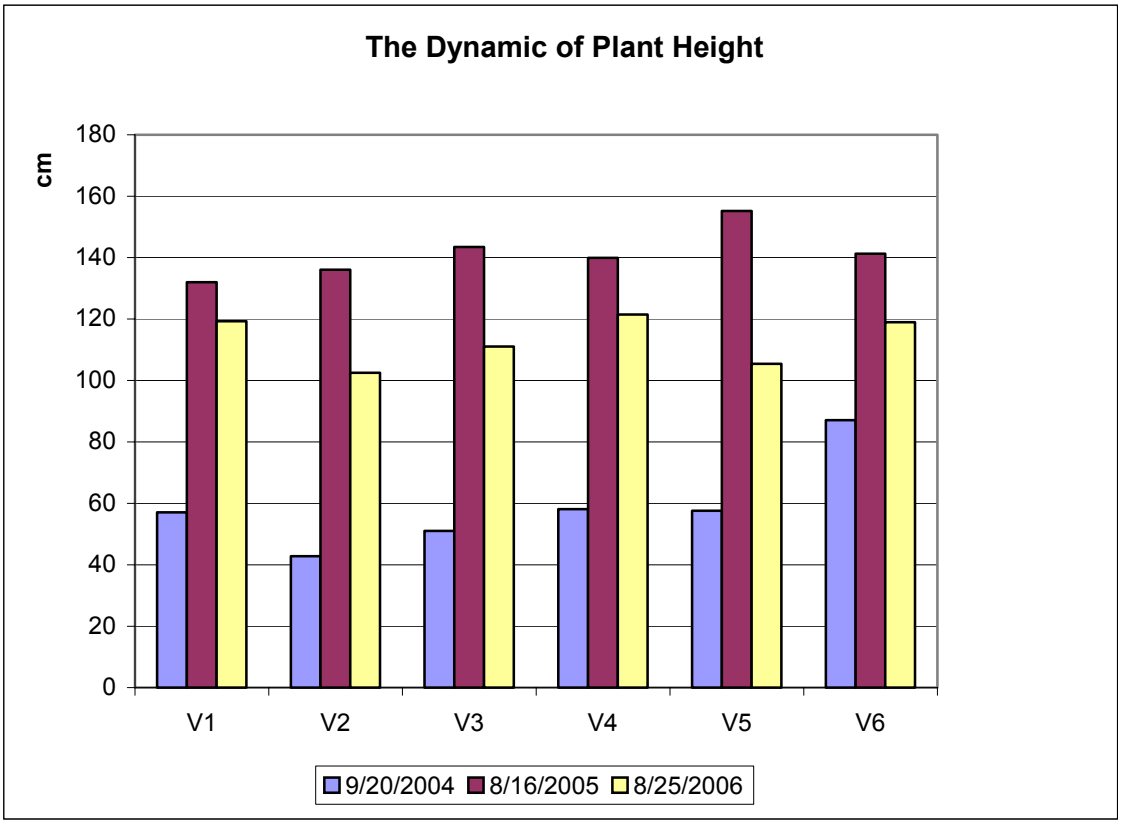

The Dynamic of Plant Height
cm
180
160
140
120
100
80
60
40
20
0
V1
V2
V3
V4
V5
V6
9/20/2004
8/16/2005
8/25/2006

Fig. 3

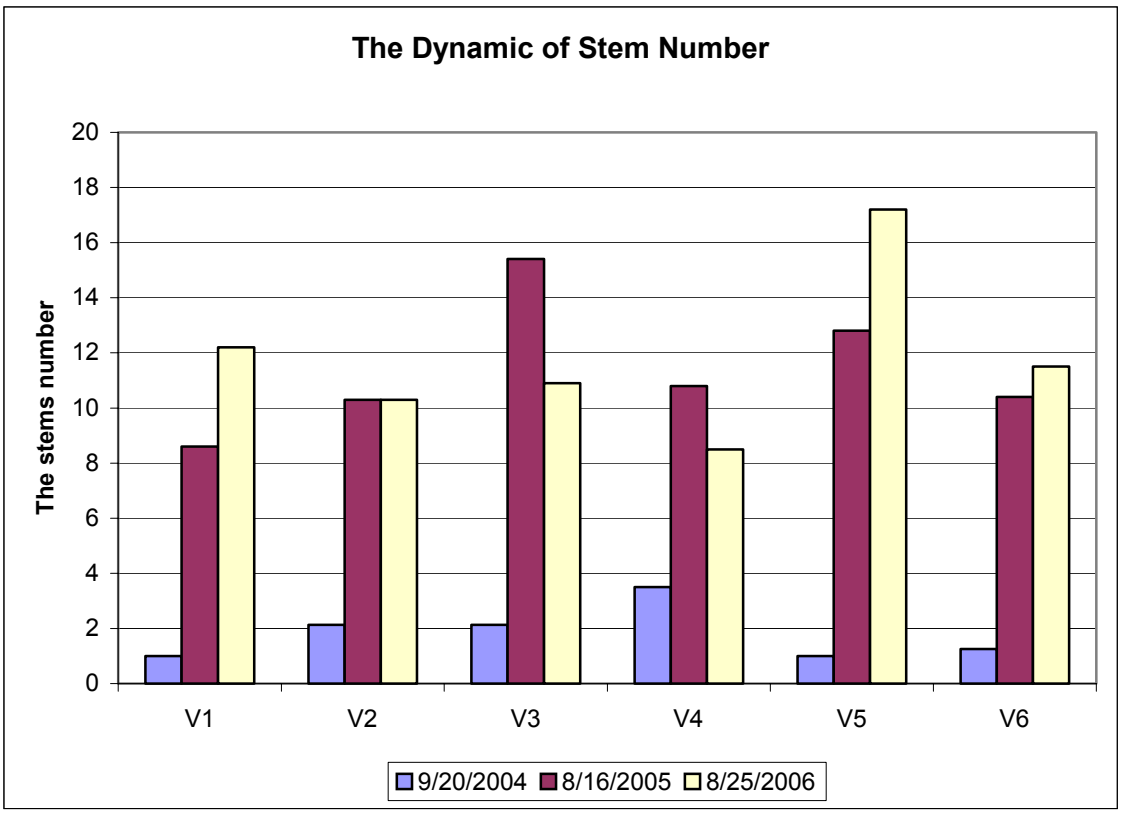
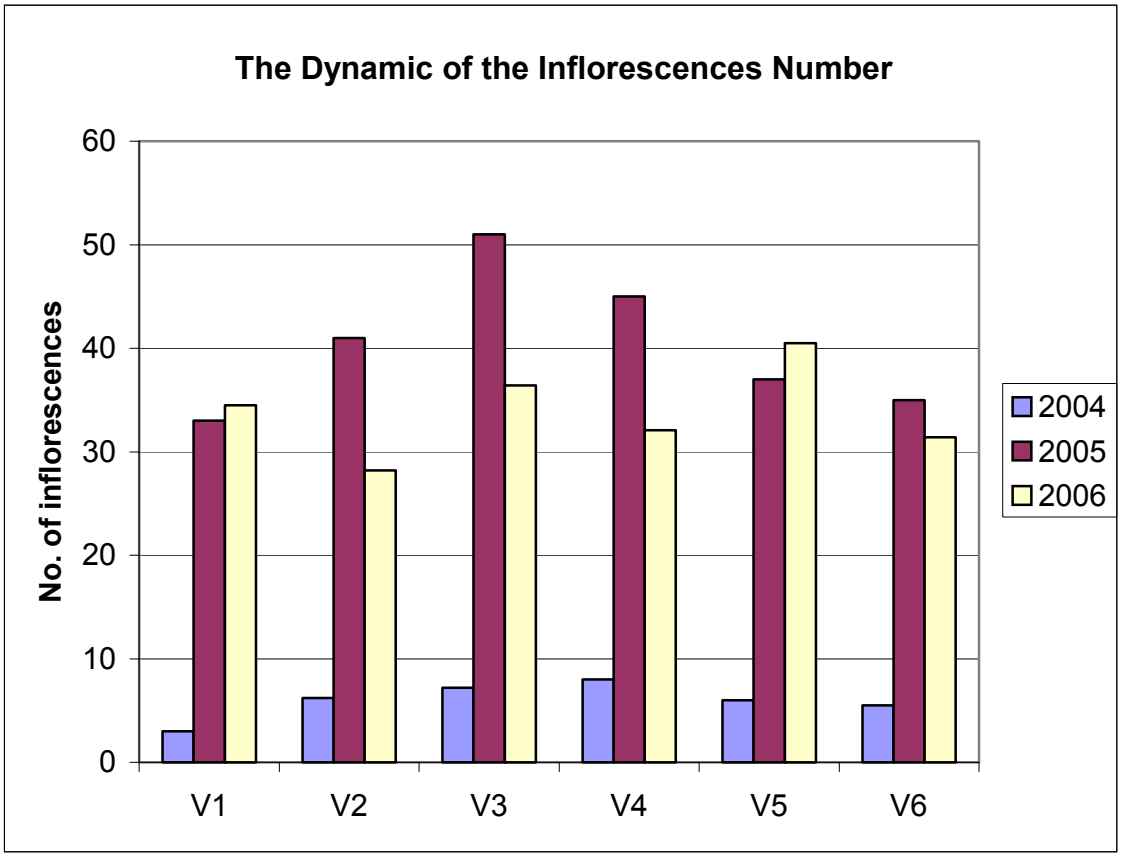

The Dynamic of Stem Number
The stems number
20
18
16
14
12
10
8
6
4
2
0
V1
V2
V3
V4
V5
V6
9/20/2004
8/16/2005
8/25/2006

Fig. 4


The Dynamic of the Inflorescences Number
No. of inflorescences
60
50
40
30
20
10
0
V1
V2
V3
V4
V5
V6
2004
2005
2006

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RESEARCH REGARDING THE GROWTH AND THE FLOWERING OF SOME *ECHINACEA* SPECIES IN THE ECOLOGICAL CONDITIONS OF ROMANIAN PLAIN

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ABSTRACT

The researches have been sustained in the field of U.S.A.M.V. Bucharest during the period 2004-2006, having the main purpose the determination the behaviour of some *Echinacea* species in the ecological conditions of Bucharest. The adaptation of *Echinacea* species to the climatic condition of our country seems to be not a problem; these plants are frost and drought resistance.

MATERIALS AND METHODS

This experiment was based on researches regarding the growth and flowering of 4 *Echinacea* species: *Echinacea simulata* McGregor*, E. atrorubens* Nutt.*, E. tennesseensis* Small and *E. purpurea* Moench. The seeds used for setting up this cultivation (for the first 3 species) were imported from Holland and for *Echinacea purpurea* Moench seeds imported from Hungary. For sowing was used leaves soil sifted. The depth of sowing was 1-2 cm.

After plant emergency was made the prick out in pots with the diameter of 9 cm with one plant for each pot. Planting in the experimental field from U.S.A.M.V. Bucharest for the species *Echinacea simulata* McGregor*, E. atrorubens* Nutt.*, E. tennesseensis* Small was realised in 2004, in the first decade of August (Table 1). For *E. purpurea* Moench sowing was realised in the second decade of April and planting in the field in the last decade of May. The distances between plants were 50/30 cm.

During all the vegetation were applied the general maintenance works: the hoeing, the weeding, the irrigation and if was necessary the plant tying (because of the rains with heavy wind during the summer).

There were observed important differences regarding emerging percentage to the third species (*E. simulata* McGregor*, E. atrorubens* Nutt.*, E. tennesseensis* Small) and *E. purpurea* Moench. For the first species, emerging percentage was between 25 and 40% and for *E. purpurea* Moench was between 47-78%. The springing period was also different, 45 days at *E. simulata* McGregor*, E. atrorubens* Nutt.*, E. tennesseensis* Small and 39 days at *E. purpurea* Moench.

RESULTS AND DISCUSSIONS

At *E. purpurea* Moench was observed that the maximum growth was realised in the second year of the culture and at the others studied species, almost 4 months later from the planting date. The maximum vegetative potential was reached in the third year of cultivation. These results can be very important if we are interested of vegetative production which can be obtain at *Echinacea* culture and the efficiency that can be realised by this plant. The capacity to form stems was well pointed out too, at *E. purpurea* Moench, especially during the second and the third years of cultivation when were obtained 15 stems/plant (Table 2). Among the others *Echinacea* species was remarkable *E. atrorubens* Nutt.. That formed 5 stems/plant during the second year.

An important aspect is the fact that a late planting influence especially the capacity to form sides shoots. *E. tennesseensis* Small had a smaller capacity to form side shoots with no ramifications. Another characteristic of *Echinacea* species is a certain horizontal growth tendency in the first year. In this period the plats develop short leafy side shoots. During the next years the tendency is to increase the growth of stems and side shoots, reducing the number of leaves.

Blooming capacity of *Echinacea* species is spectacular too. The first that bloom are leading inflorescences, followed by the ones from the side inflorescences (excepting the colder autumns when is the possibility that these inflorescences can not rich their maturity).

CONCLUSIONS

Regarding the influence of climatic conditions from the plain aria, respective Bucharest zone, concerning different species of *Echinacea* studied, we can say that generally speaking, the climatic conditions do not affect the growth and developing of the plants during all the vegetation period. The adaptation of *Echinacea* studied species, to the climatic conditions from our country, seems to be no problem because in their natural habitat (Central America and North America) *Echinacea* species are cold resistance and to the heavy winter conditions, can tolerate –25…-40°C, (these conditions are realised in our country too), but only with the conditions to be cover with snow. In Europe, *Echinacea* have a good resistance over the winter in the south and central zones. The north limit for the commercial cultivation of this plant is Scandinavia.

The characteristic climate from Romania is temperate-continental, semi-arid, with temperatures that could reach high values during the summer (42,4°C registered in July 2000) and frost temperatures during the winter (-23°C, registered in February 2005) (Table 3). The frequency and the lasting of these extreme temperatures is generally pretty low. If we analyse a restrictive factor for the *Echinacea* in our country especially the Bucharest region, we could find the low temperatures during the winter. But these temperatures have not the probability to last enough to damage the plants. The precipitations for *Echinacea* in this region are enough for the plant necessary. Some difficulties can appear when the rain comes with storm (for example the year 2005 when there was heavy rain 154 mm during the period July-September associated with storms).

The sensibility of *Echinacea* at these climatic conditions is due to the stem height (over 1 m) associated with the reduced thickness of them. In these conditions we recommended to tie the plants to prevent their snapping.

Concerning their natural conditions it is not surprising that the Echinacea are well adapted at the drought in Europe. In culture the plants tolerate drought very well during long periods.

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3. Şelaru Elena – *Flori cultivate în grădină*. Editura M.A.S.T. 2001.

Table 1

Experimental variants

Variant	Sowing date	The seedlings age (days)	The planting age
E. simulata McGregor	18 .05.2004	45	09.08.2004
E. atrorubens Nutt.	18.05.2004	45	09.08.2004
E. tennesseensis Small	18.05.2004	45	09.08.2004
E. purpurea Moench	22.04.2004	39	25 06.2004

Table 2

Dynamic of growth and plant flowering at different species of *Echinacea*

Variant/ Observation date	Plant height (cm)			No. of stems /plant			No. of inflorescences		
	2004	2005	2006	2004	2005	2006	2004	2005	2006
E. simulata McGregor	12.40	29.70	72.10	1.00	3.00	6.09	2.30	7.00	7.00
E. atrorubens Nutt.	18.70	53.60	99.90	0.60	1.00	17.20	2.00	8.00	34.2
E. tennesseensis Small	11.80	35.00	86.75	1.00	3.00	5.89	1.20	5.00	8.86
E. purpurea Moench	87.10	141.20	119.00	1.25	10.40	11.50	5.50	35.0	31.4

Table 3

The variation of climatic factors (annual average)

Years of observation	Annual average temperature (^{0}C)	Annual average precipitations (mm)	Annual average relative air humidity (%)
1901- 2000	11.0	567.7	-
2004	10.3	715.0	76.4
2005	10.1	1076.6	77.9
2006	10.6	545.9	74.8

Fig. 1

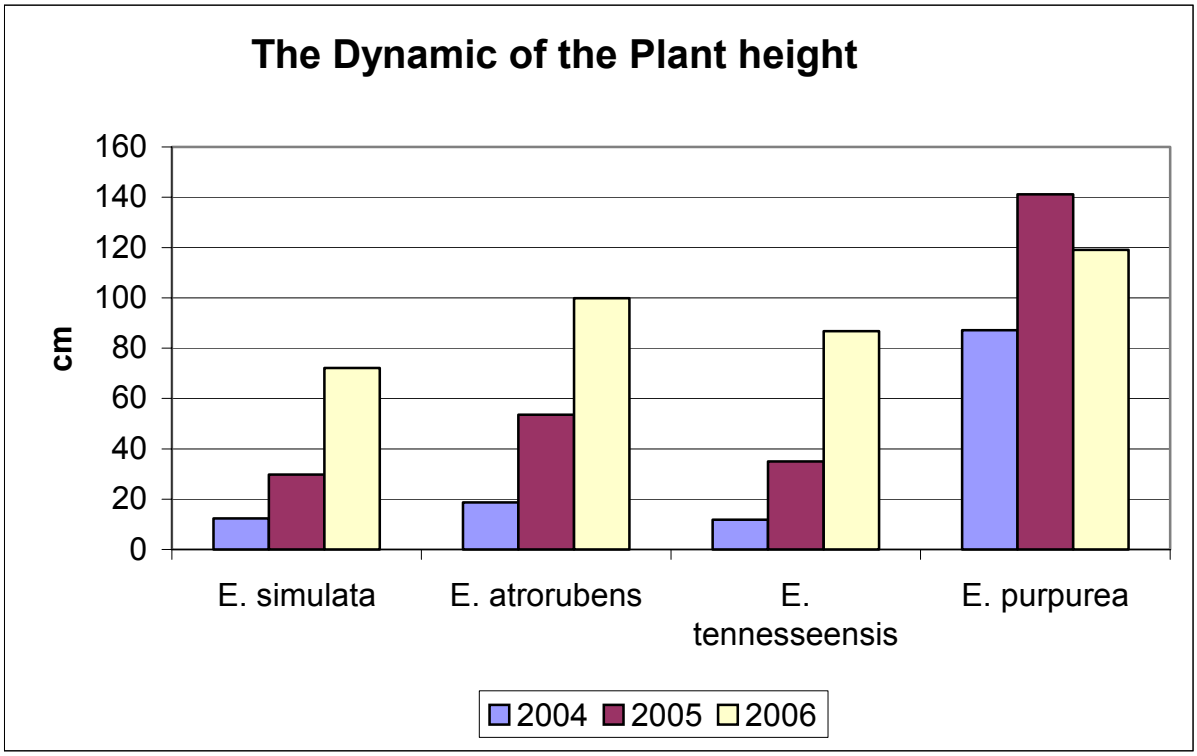

The Dynamic of the Plant height
cm
160
140
120
100
80
60
40
20
0
E. simulata
E. atrorubens
E. tennesseensis
E. purpurea
2004
2005
2006

Fig. 2

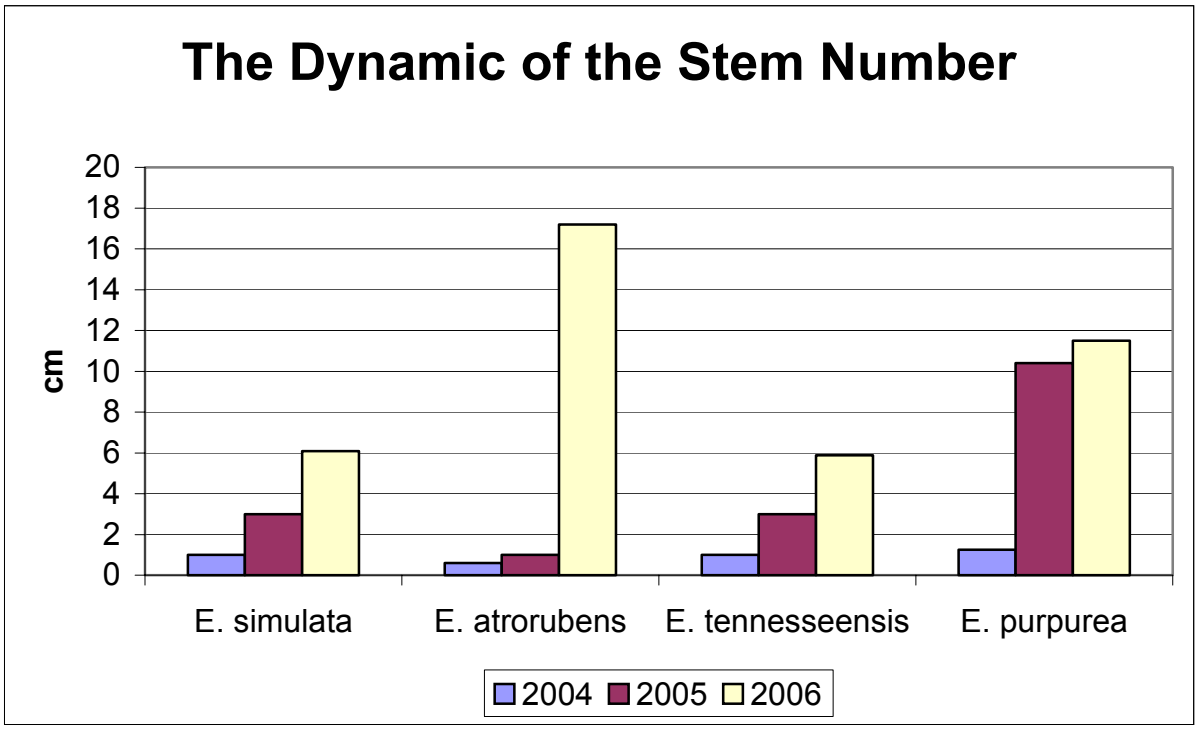
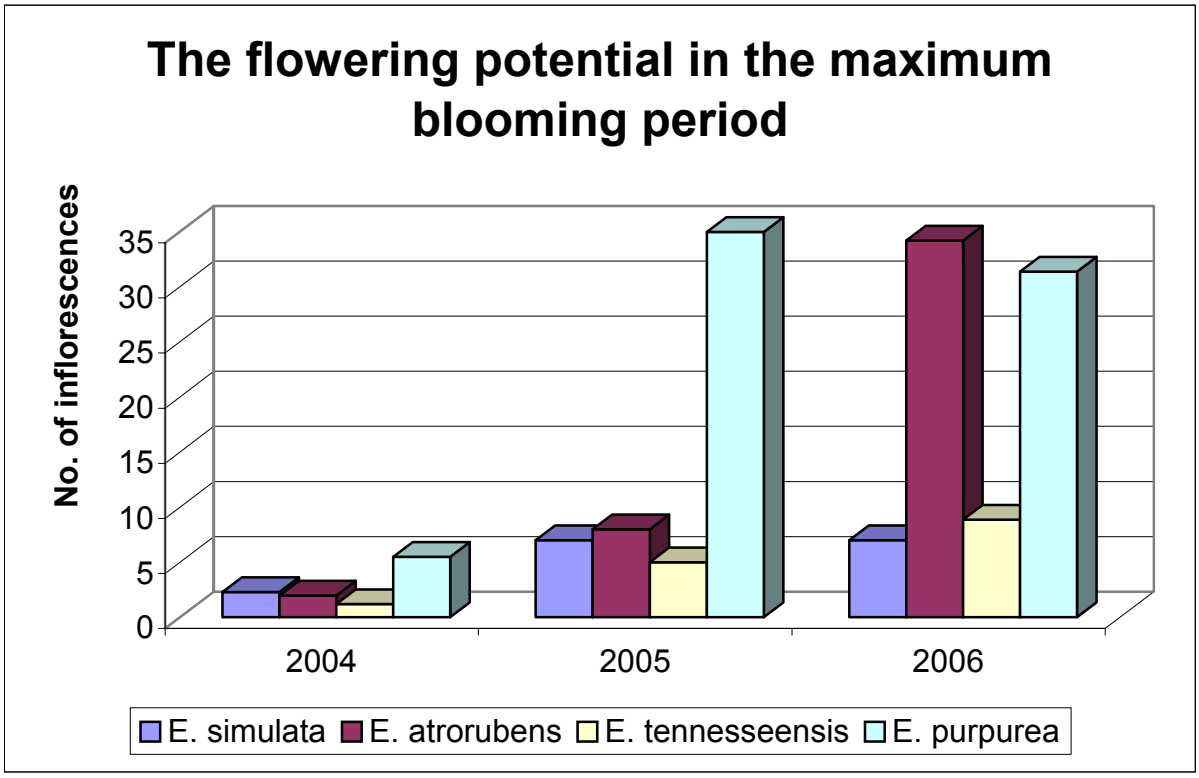

The Dynamic of the Stem Number
cm
20
18
16
14
12
10
8
6
4
2
0
E. simulata
E. atrorubens
E. tennesseensis
E. purpurea
2004
2005
2006

Fig. 3


The flowering potential in the maximum blooming period
No. of inflorescences
35
30
25
20
15
10
5
0
2004
2005
2006
E. simulata
E. atrorubens
E. tennesseensis
E. purpurea

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THE URBAN GREEN SPACE - FUNCTIONS AND AMBIENT DIVERSITY

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Keywords: multifunction, integrated functions, integrating functions, functional profile

ABSTRACT

The study is meant to put out the diversity of the functional aspects of the urban green spaces and the principle types of functions: integrated and integrating functions. They are analyzed under the aspect of their ambient effects on urban level, by referring to parks recently made in Europe. There are also brought out the functional profiles as well as the activities and endowments attributed to them.

INTRODUCTION

The complex-functional organizing, as a result of the multitude of urban functions, materializes itself regarding the urban green space, through the existence of **the integrated functions** and of **the integrating functions**, which we will define by the functional criteria:

The integrated functions are the ones included in the structure of the urban activities (circulation, living, work, industry, commerce etc.), and which are subordinated to the dominant urban activity. The green space, in this case can have a character specialized on a certain type of functions or unifunctional. The integrating functions of the spaces planted are present in the complex spatial-functional unites specific to the urban recreation. These integrating functions become dominant in connection with other urban activities (culture, education, commerce etc.), and they include other urban activities which become subordinated to the integrating function. The green space has, in this case, a complex character and most often a multifunctional one (Fig. 1).

MATERIALS AND METHODS

Urban green spaces with integrated functions- a relevant example for this category of functions is the CentrO Neue Mitte-Oberhausen, Germany. The green space is perfectly integrated in the major urban functions (the area has a powerful commercial character, with stores type Mall, business centre, parking, hotel, terraces and restaurants, promenade). The integration of the planted spaces increases the esthetical-ambient quality of the whole urban ensemble and in the same time, with the presence of water, represents a factor of microclimate attenuation (the humidification of the air, shadowing, the reducing of noise and the purifying of the air).

The ensemble plan reveals the integration of the planted spaces in the major urbanistic functions of the square dominated by architectural volumes and by the net of circulation paths from the area; the green space is subordinated to the urban functions, representing an element of connection between them, and in the same time a factor of reducing the urban heat island, manifesting in this way its ecological quality(Fig.2).

Urban green spaces with integrating functions- as complex spatial-functional unites specific to urban recreation, these spaces integrate a series of important functions and urban activities. We shall analyze a self-evident example in this sense: Millenáris Park from Budapest (Fig. 3, 4,5).

Realized in the context of rehabilitating the industrial zone of Ganz, the park was conceived- as a functional structure- in two principle sectors of the cultural-educational profile: the "motivation" and the "creation", developed in a composition which includes both urban and natural elements.

The park integrates cultural and educational functions expressed by activities like: expositions, shows, classic music concerts, special programs for children, but also ecological functions expressed by plantations of arbores in alignments, plantations reminding of the spontaneous flora, modulations of the micro landscape. The endowments and arrangements destined for the marching of these activities are the most diverse: reception halls, theatre, expositional centres, pavilion for music, corridors of glass which bond the diverse zones and endowments of the park, places of rest and sitting, pond, lake and modulations of the landscape, plants which we can find in the natural environment. We can observe in the case of this park, on one side the **diversity of functional profiles** (recreational, cultural, educational, ecological) and on the other side **the functional diversity** which is found in the flexible functional structure and in the multiple utilization of the zones or under the zones of the park. The functional organization permits the concomitant usage of the functional endowments as well as the intermittent one. The preoccupation for the **special-functional quality** of the park is obvious, but in the same time there were satisfied **ecological aspects of the quality**: the vegetation reminding of the spontaneous flora, the presence of the water surfaces or the modulation of the micro landscape in forms as natural as possible, all having incontestable ecological qualities. The functional diversity is materialized by functional profiles specific to the urban green space: recreative profile (passive- rest, repose and active- promenade, entertainment), cultural-educational profile, entertainment profile, play profile, sports profile, sanitary-hygienic, utilitarian profile. It is remarked the actual tendency of not attributing to an urban green space unity or to a green complex , a dominant profile, but to integrate more profiles into a multifunctional concept. This tendency may be explained by the **need of efficiency** on the green spaces, functionally speaking, and on the other hand by the need of a greater usage of these spaces, for all age categories, and in consequence the increasing of the interest in the socio-human plan for the green spaces of the city.

Example: the "Millennium Park" project (Fig. 6, 7) elaborated by a collective of students of the Faculty of Architecture from the Technological University- Wroclaw, studies the problems of integrating the educational and professional aspects, in an original concept.
The project was presented by Alina- Drapella Hermansdorfer and Pawel Ogielski at the ECLAS conference- Budapest 2002[20]: the park occupies a surface of approximately 100 ha and is divided equally in two sections: a project of woods and a recreational one, which constitute the two "green poles of development". The fundamental concept ideas are based on the harmonious combination of the symbol elements, the solving of environmental problems and solutions which are addressed to the community's needs; the sit is bordered from three sides (triangle shape) by: a river, a railway, and a living area.

Symbolic aspects: they are related to the existence of mount Sleza (the only form of landscape) and to the historic background, on this mountain having its residence the Piast dynasty (the one which founded the city). The park is meant to be a symbolical pass way between the airport and the city centre. In the river meadow area (adjacent to the river) there will be organized festivals related to different cultural events. The boulevard of the ten centuries- as a symbol element- constitutes the entrance to the park and will have ten alleys, each one of them with a hundred arbors (on five rows). These alleys will constitute a sort of "vegetal chronics" and each one them will symbolize a century. The disposing of the arbors will symbolize events from the town's history, and on each alley there will be planted different species of arbors. Symbol elements will also be the flower festivals in the tradition of the XVIth century (in honor of the goddess Flora).

Social aspects: the park responds to the actual needs of the community: the attraction for young people, the separation of the commercial functions, spaces for bicyclists, alleys for walking, roads for dogs, circle festivals. The artificial lake (approximately 6 ha) will constitute the main attraction, in the summer it will be used for nautical activities, and in the winter for ice sports. The park will also solve problems of car circulation (parking and bus station) and in the neighbourhood there will be realized tennis courts and arrangements for extreme sports.

Environmental aspects: the sit in which the park was supposed to be realized suffered because of the great floods in 1997; it is intended to stabilization of the hydrological regime and the amelioration of green house effect, by planting species characteristic to the river meadow area and water species. Species of birds and plants (arbores and bushes) from the local fauna and flora will remake the biotope of the river valley.

RESULTS AND DISCUSSIONS

We can affirm that the multifunctional is in direct relation and includes the approach of the ecological functions of the urban green entities, constituting itself in parallel-alternative components of the quality of the urban green arrangements. The functions which assure the triple quality of the recreative-public space, urban ambient space and space with valences socio-communitarian polarization are schematized in table 1. In the same time, as an actual tendency, there can be remarked the special attention given in present to the theme parks: may it b that they approach a symbolical, historical, cultural or educational theme these parks have a specialized character, based on specific functional profiles (Fig. 8).

CONCLUSIONS

We can affirm that the urban green spaces- through the multitude of functions that they have- contribute to the urban ambient diversification and to the efficiency of their usage by the residents of the city. Multifunctionality assures a large-scale usage by population of all age categories, responding to the general interest of people in urban public green spaces.

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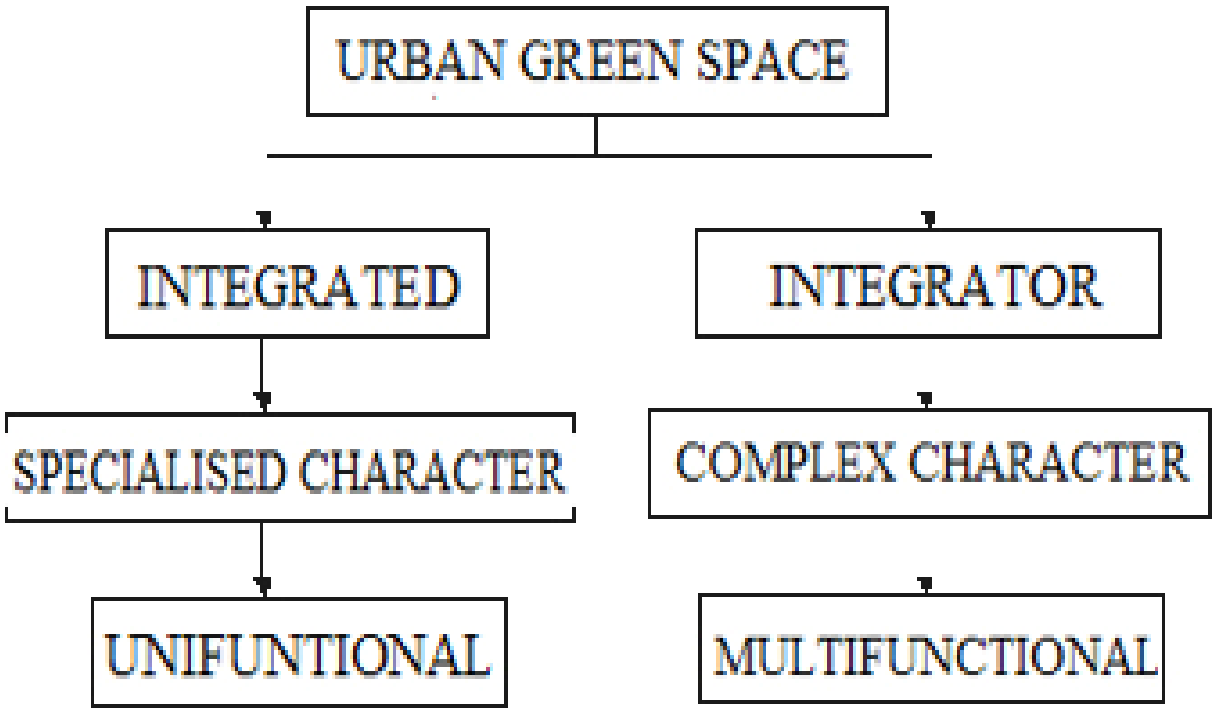

Fig.1 The functions of the urban green space

Fig. 2 View of the CentrO Neue Mitte-Oberhausen, Germany

Fig. 3 Millenáris Park- Budapest, Hungary - The plan of the park

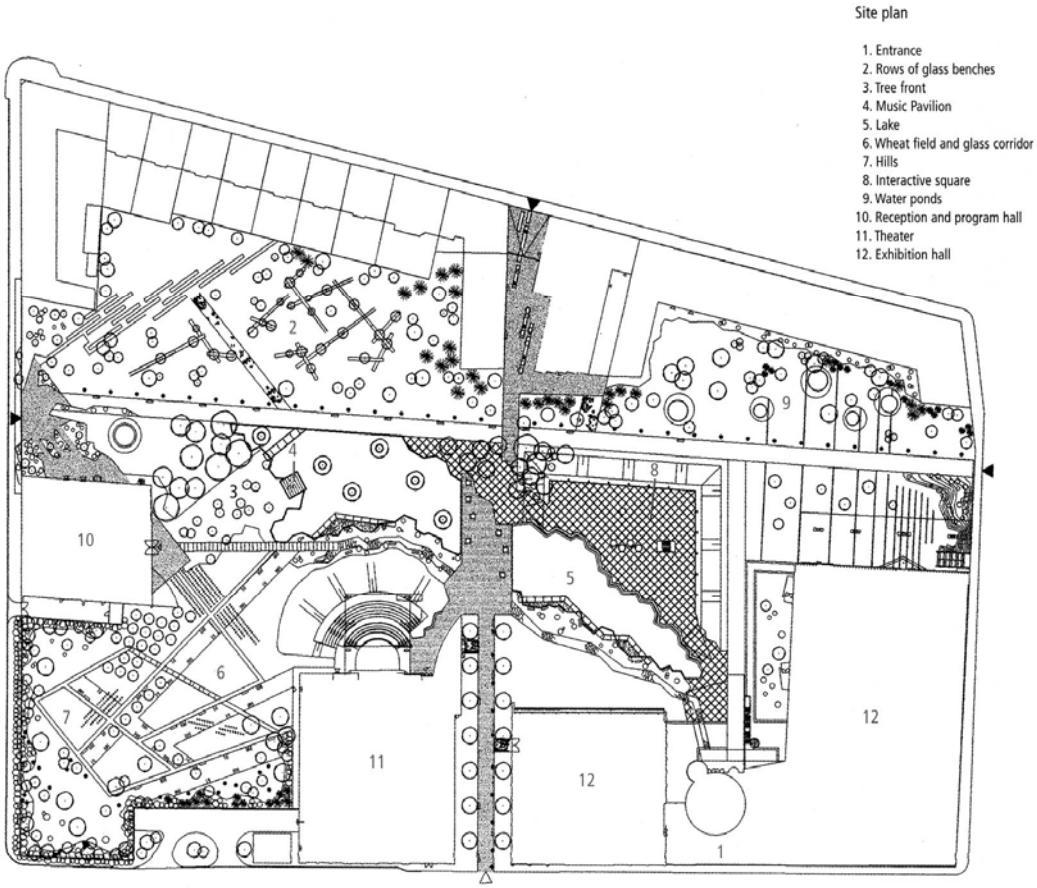

Fig. 4 Millenáris Park- Budapest, Hungary - interactive square with plurifunctional character

Fig.5 Millenáris Park- Budapest, Ensemble view (promenade, rest etc.)

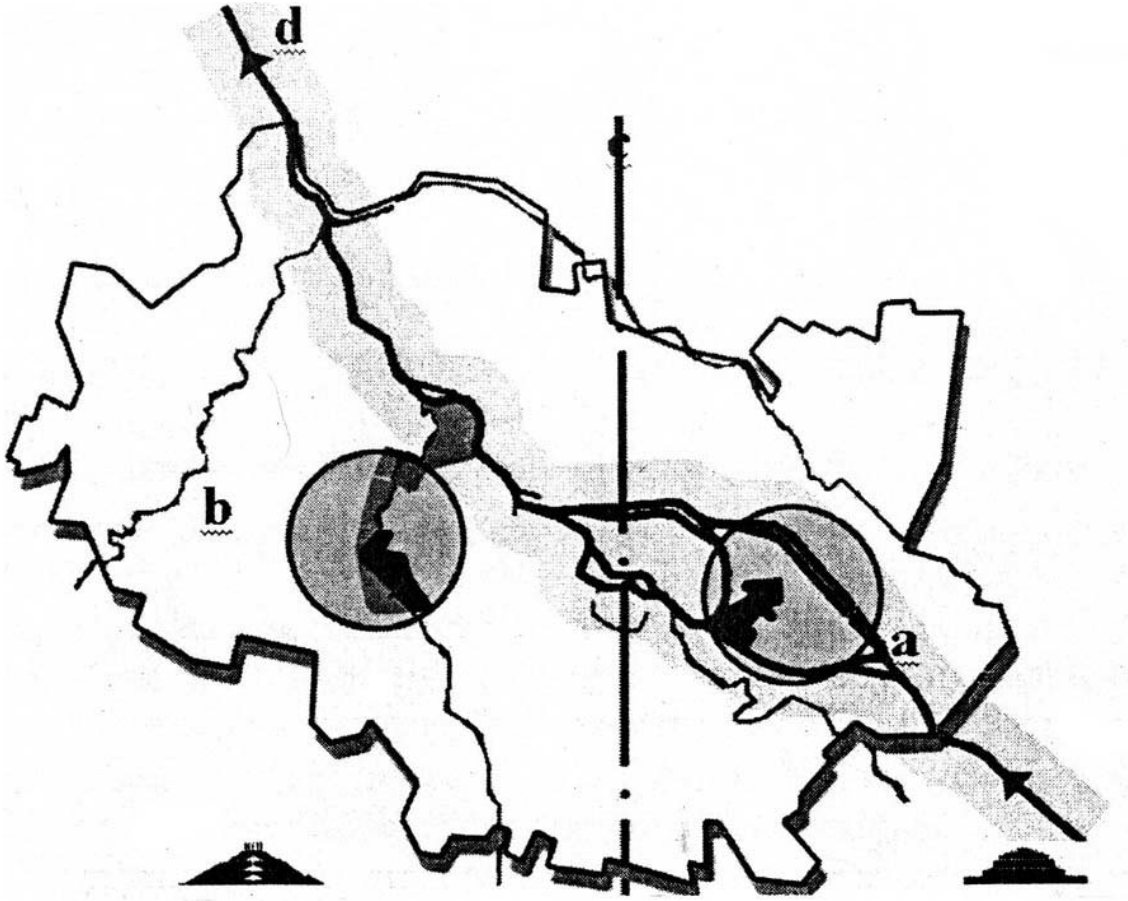

Fig. 6 Millenium Park- Wroclaw, Polland
The conceptual scheme of the park

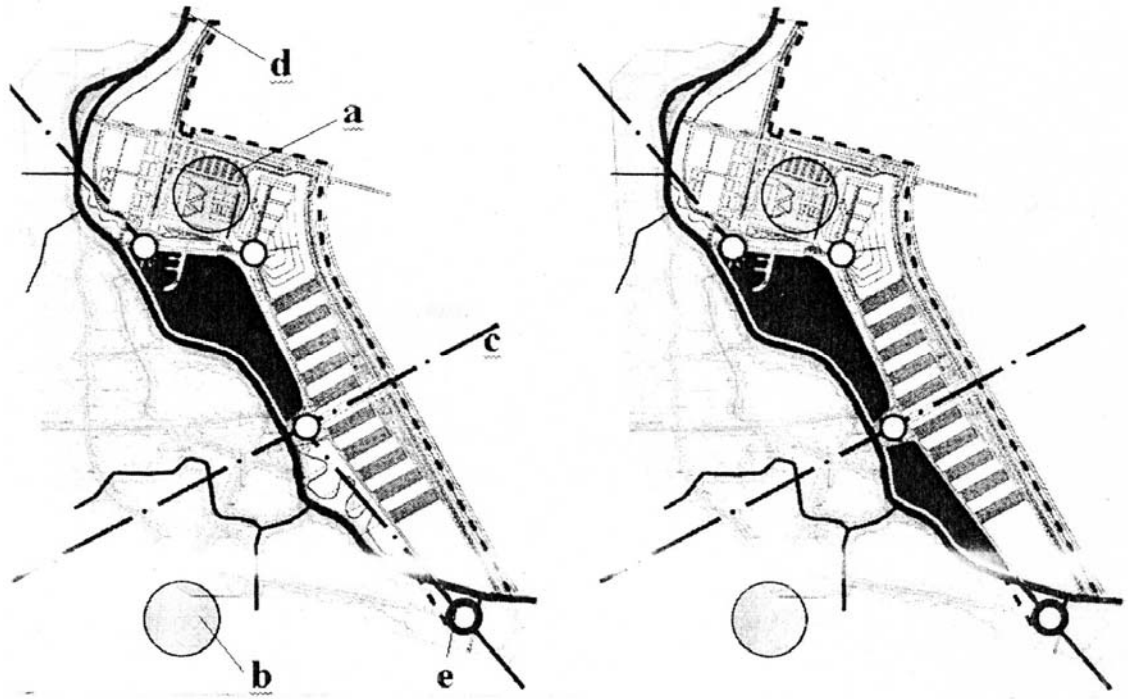

Fig. 7 Millenium Park- Wroclaw
The schematization of the axiology and functionality of the park

Fig. 8 Post Industrial Park- Eberswalde, Germany
Plans and images from the Medical Garden and the Senses Garden, each of them with functional-thematic organizing specific to these individual gardens of the park

Table 1. Components of the functionality of the urban green space

functional profile	**activities**	**endowments**
recreative	rest repause promenade	platforms, benches, pavilions, kiosks
cultural-educational	shows, projections diverse cultural manifestations, expositions, lecture	polyvalent halls, theatre, cinema, planetarium, platforms, exposition halls, lecture pavilions, libraries
entertainment	dynamic activities with a high rate of mobility, nautical diversion	installations, specific constructions and equipment
play	activities related to games destined for children, young people and third aged people	play spaces equipped with play objects for different age categories
sport	sport practice (especially table sport) including nautical sports	sports fields, installations, covered sport halls, specific equipment for nautical sports
public alimentation	table serving, coffee, sweets, refreshments, organizing festive events	restaurants, coffee shops, tea shops, pizza restaurants, sweet shops, food stands

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THE ESTHETICAL DIVERSITY OF THE URBAN GREEN SPACES AND ITS EFFECTS IN ECOLOGICAL MATTERS

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Keywords: composition, harmony, unity style, esthetical-compositional factors.

ABSTRACT

The study analyzes aspects of the esthetical diversity of the urban green spaces and their correlations with the ecological effects. In this sense, there are taken into account the compositional harmony, the presence of water and its ecological role in the arrangement of urban green spaces, the principle of unity and diversity, the special-volumetric harmony and the vegetal as a compositional-esthetical factor.

INTRODUCTION

The esthetical diversity as well as the esthetical value quality implies- under an objective approach- components such as: the usage of the colour effects in relation with the function, the opportunity of the vegetal composition, the harmonization under the relation of composition and styling of all the compositional elements: landscape, waters, vegetation, decorative objects; they are organized after compositional principles such as: unity and diversity, harmony, coherence and spatial equilibrium. Taken from a subjective appreciation angle, the esthetical diversity finds itself- in the plan of esthetical quality- through quality effects such as: dynamism, greatness, contrast, accent, rhythm.

MATERIALS AND METHODS

The harmony of the compositional elements which realize the arranged green space is a factor of creating the specific ambiance. The landscape, waters, vegetation and decorative objects enter in compositional relationship following principles of consecrated styles in landscape, or approaching nonconformist compositional solutions, in attempt to experiment new formulas, compositionally and stylistically speaking. Through the quality of the esthetical value of these compositional manors, the urban green space becomes a factor of cultural affirmation of the urban landscape. In this sense, the esthetical value has a determinant role in the cultural landscape.

Water is a compositional element important in the landscape arrangements. May we see it in the form of calm surfaces, quite or in the form of cascades and flowing waters, water enters in compositional resonance with the other elements which compose the landscape (vegetation, rock, built elements, decorative objects). Despite the **compositional-esthetical** aspects of water usage in landscape compositions, water also has **ecological qualities: humidification and refreshing of the air by the process of evaporation** (annual average of 3-4 mc/ha water shine). Still related to the evaporation process, the temperature at the surface of the water shine is with 4°-5°C lower than in the surrounding environment, and in the immediate neighbourhood of the water surface, the temperature drops with 1°-2°C. **The ecological role of water is important also regarding biodiversity: important surfaces of lakes from the urban parks or courses of water from inside the city form- together with vegetation- the habitats for many species of urban fauna and flora.** May it be conformed

in architectural spaces an shapes, or may it have a natural aspect of compositional presence, water induces the most diverse states of mind on the human psychic: calm, tranquility, relaxation, dynamism, joy, sadness, force or disturbance (Fig. 1, 2, 3, 4, 5, 6). In the Japanese gardens and parks, the presence of water is firmly related to the natural character, illustrating the ecological aspects of compositional-esthetical quality: shapes and surfaces of water naturally bordered by micro landscape and indigene vegetation; the landscape-water-vegetation ensemble contributes not only to the conformation of the composition, but also has certain ecological valences because of the resemblance with the natural habitats. When we refer to the compositional harmony we must remember the "unity and diversity principle" as a compositional one which contributes to the greatening of the esthetical value of a green space arranged and to the tying of this esthetical value to the ecological one.

The **unity** we find as a compositional principle no matter the style is the factor which "joins" compositional elements between them. **Diversity** (which we find everywhere in nature) intervenes also in composition to personalize it and to confer it specificity. In this way composition not only has esthetical value, but also has ecological quality. This affirmation can be explained in ca of an urban plantation (park, square etc): the massifs planted have in their composition a dominant species- as a unity element- but also species which confer diversity to the plantation. This is not only an esthetical quality but also an ecological one: a monospecie massif (monoculture) has a smaller esthetical value because of its monotony, and also has a larger bio-ecological vulnerability- for example to diseases and pests- than the plurispecies massifs where the biodiversity permits the development of a lasting ecosystem. Compositional unity- based on classical elements of composition (axiology, geometries, symmetry) - can be illustrated with the ground floor of the Carrousel Arch from Paris (fig.7). The general lines and compositional shapes record in full unity with the architectural-urban shapes, and unity as a compositional principle is sustained also by the vegetal element: alignments of lime trees and lawns- which constitute characteristics of the Tuileries Garden. The hedges from yew tree which develop through radial rows and Cartesian and circular shapes become new components, diversifying ones in compositional plan.

The spatial-volumetric harmony, along with the compositional one, leads in equal matter to high quality effects in esthetical plan through dynamism, equilibrium, coherence, rhythm, contrast, accent (Fig. 8, 9, 10).

The vegetal as a compositional-esthetical and ecological factor: of all the landscape composition elements, vegetation has the most important quality valences in ecological plan which often are prior to the esthetical-functional qualities. Both in parks and gardens, but also in urban forests ensembles, vegetation- through the immense variety of species- puts together a vegetal system on more than one bearing: the covering of the ground, the medium bearing (the bushy vegetation) and the upper bearing (the arbor vegetation). This "floorage" of the city's green infrastructure has its own esthetical and functional-ecological value. The opportune usage of the e vegetal element sustains the quality of the planted spaces, both under functional and esthetical-ecological aspect, contributing to the creating of the specific ambience of the space, in concordance with its character. The vegetal can be organized in space with true architectural character, or can be used in restrained spaces with intimate or picturesque character. The esthetical-landscape of the vegetal (shape, port, corona, dimensions, colouring, flowers, fructifications), the variety of species as well as ways of associating them, make of the vegetal element an "esthetical ingredient" almost indispensable in an urban landscape arrangement. Out of all the components of the vegetation, arbors have the greatest visual energy, imposing their self through scale and habitus, may they be disposed as separated pieces or by groups. The landscape expressivity of the growing shapes is different: columnar silhouettes (famous varieties of leafy trees and cone trees called "Fastigiata"), pyramidal silhouettes and the ovoid ones, where the vertical predominates, are

dynamic shapes; the globules ones, exposed (larger, but not necessarily high), tabular (flat) and hairy and static shapes, suggesting in the scenery calm and relaxation. These visible qualities of the esthetical value are perceived subjectively, and the response in the perception plan is that given by the psychological effects (dynamism, anxiety, calm, relaxation, melancholy etc.). The absence of leaves in the cold season puts out more pregnant the architecture of the arbors, often creating remarkable landscape effects thanks to the branches and trunks. Especially in the plantations which permit the observing of the silhouettes (groups, alignments, individuals situated solitary), but also in association with built volumes there can be realized harmonies and shape contrasts, certain architectural effects and distinctive aspects of the evidenced composition through the vegetal design.

RESULTS AND DISCUSSIONS

The implication of the ecological quality in aspects of the esthetical quality, supposes the **relating** of the functionality with the aspects of the esthetical quality- by mans of objective or subjective appreciating and with the ecological qualities of the urban green. This relation proves the **interdependency** of the esthetical and ecological bearings of the quality of the urban green spaces.

CONCLUSIONS

The aspects of the esthetical diversity of the urban green spaces determines a series of beneficial effects on the ecologic plan with a positive impact on the urban microclimate and on the state of physical and psychical health of the inhabitants of the cities. The esthetical diversity has as an effect ecological benefits and the relation between these quality bearings is strongly related to the urban comfort, with positive results in the increasing of the quality of life.

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Fig. 1 Detail of the Sculpture Park from Vassivière- Limousin, France
The modulation of the micro landscape in harmony with the general composition of the space is meant to create a space as natural as possible in which vegetation and rock predominates

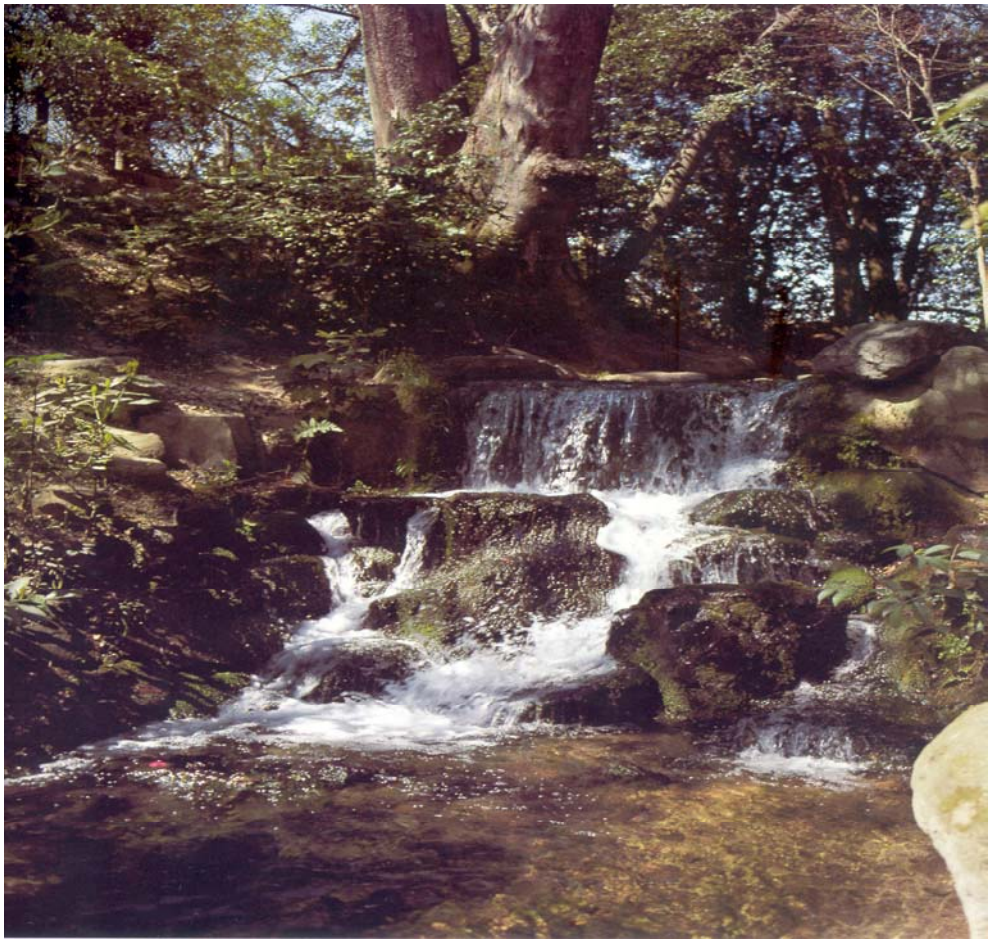

Fig.2 Image of the naturalistic cascade from the Koraku-en Park, Okayama, Japan

Fig.3 Water configured in a pond with rigorous shape, enters the composition with the exuberant vegetal element

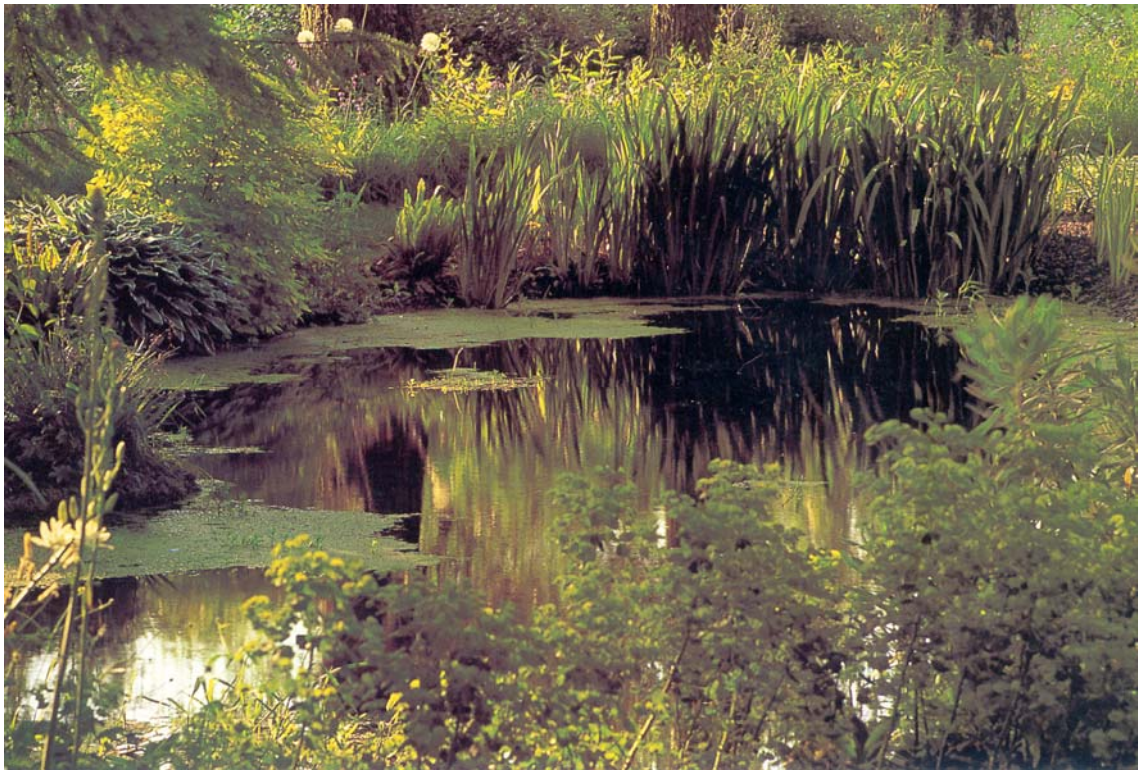

Fig.4 The presence of water in a natural configuration gives the garden space a picturesque character, also sustained by the vegetal element

Fig. 5 Image from the Genkyu-en Park, Japan

In the Japanese gardens the presence of water is characterized by the natural aspect, without shape constrains or contour realize by built elements

Fig. 6 Image from the Joju-en Park, Kumamoto, Japan

Fig. 7 Air view- Carusel Park, Paris

Fig. 8 Alignment in Los Angeles- California, S.U.A.
The rhythm as a major element of the special-volumetric harmony

Fig. 9 Accent and contrast- harmonic components of the space volumetry

Fig. 10 Square from Barcelona, Spain

The space-volumetric harmony is characterized by the dynamism of shapes and compositional elements

Fig. 11 Image from the Foggy Bottom Garden- Norfolk, England.
The vegetal element through the composition of herbs and cone trees

Fig. 12 Thury-Harcourt Garden, France
The vegetal composition shines through the presence of flowers

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THE INFLUENCE OF BIOTICS AND ABIOTICS FACTORS ON *IN VITRO* MULTIPLICATION OF *EUSTOMA GRANDIFLORUM*

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Keywords: photoperiodism, micropropagation, *in vitro*

ABSTRACT

Our researches were about the behavior in the multiplication *in vitro* phase of three cultivars of *Eustoma grandiflorum*, in different conditions of nutritive medium and photoperiodism. We are experimented with six nutritive medium variants, formed from MS (1962) basis medium and variable factor BAP, TAZ and kinetin, in 0,250 and 0,500 mg/l quantity for each substance. We used two levels of photoperiodism: 16 hours (standard variant) and 12 hours, and intensity of the light 3000 lux. The temperature in the growing room was 22-24^{o}C. The high influence on the multiplication rate was observed for nutritive medium. The fotoperiodism did not influence de multiplication process of the explants.

INTRODUCTION

In our country and on international plan, was effectuated many researches regarding *in vitro* multiplication of cultivars of *Eustoma grandiflorum.*

The majority of the researches was about the improve the nutritive medium, the responsible factor for the rise of multiplication rate (Őrdőgh and colab., 2004).

The objectives of the researches:

- to increase of the *in vitro* multiplication rate to *Eustoma grandiflorum,* through improve of the nutritive medium;
- to reduce the costs in multiplication phase for optimization of the photoperiodism.

MATERIAL AND METHODS

a. Biological material:

- explants growth in initiation phase;
- cultivars: Echo White, Magic Blue, Asenka.

b. Nutritive medium are composed by basis medium MS (1962), and variable factor BAP, TDZ and kinetin (table 1).

The preparation and sterilization of the nutritive medium was made after the standard procedure.

- the temperature in the growing room: 22-24^{o}C;
- standard photoperiodism – 16 hours and reduced photoperiodism – 12 hours.

The experiment contained 36 variants, it was trifactorials:

- A factor – cultivar, with: Echo White, Magic Blue and Asenka;
- B factor – nutritive medium (table 1);
- C factor – photoperiodism: 16 and 12 hours.

RESULTS AND DISCUSSIONS

The multiplication *in vitro* phase may be considered the major component for *in vitro* micropropagation biotechnology of the plants.

The capacity of *in vitro* multiplication it's expressed through multiplication rate: the number of microshoots from one explant.

From the 36 variants, for Magic Blue cultivars its remark V.13 and V.19; for Echo White cultivar – V.1 and V.7 and for Asenka cultivar – V.31 and V.25, and the multiplication rate was between 24-28 microshoots/explant.

For Magic Blue cultivar we obtained the higher multiplication rate for photoperiodism of 12 hours.

The cultivar represents the main biotic factor, who responds for capacity *in vitro* propagation.

Statistic interpretation of cultivar influence on multiplication rate show that, for nutritive medium variable, the high multiplication rate was observed to Magic Blue cultivar (28 microshoots/explant) (figure 1).

In figure 2 is represented the *in vitro* multiplication rate function on nutritive medium, for different cultivars. The higher value of the multiplication rate was obtained for nutritive medium B.1.

In figure 3 is represented the *in vitro* multiplication rate function on cultivars, for different photoperiods. In multiplication process of *Eustoma grandiflorum* its confirmed the role of cultivar in interaction with photoperiodism.

The photoperiod, the required factor in *in vitro* multiplication, influenced very weak for studied cultivars (figure 4).

The regeneration of the microshoots in multiplication phase represents the principal link of the *in vitro* micropropagation biotechnology of the plants.

From the results obtained to *Eustoma grandiflorum* it's confirmed that the long of the microshoots *in vitro* regenerated is inverse with multiplication rate.

At the variant with the best results regarding the ratio of multiplication, the length of microshoot was 20.5-26.4 mm (table 2).

From these microshoots we can obtain microcutting with optimum size for rooting stage of in vitro culture.

CONCLUSIONS

The ratio of multiplication is strongly influenced by the composition of the nitrient media, achieved the values between 24 and 28 microshoot/explant.

The cultivar influenced not very much the ratio of multiplication. Regarding this aspect, the elaboration of in vitro culture for each cultivar is very important because the growing of explant depend of the nutrient media.

Fotoperiod in almost all the international papers regarding Eustoma grandiflorum is used by the 16 hours. From our research the influence of photoperiod had a small influence on the multiplication in vitro. In this sense the result achieved in the multiplication in vitro stage for 16 hours photoperiod are almost the same with the results obtaining for 12 hours photoperiod.

These results have a positive impact on consume of the energy, because reducing the period of light determinate the decreasing of costs with almost 25%, also the neon light working in plus with 25%.

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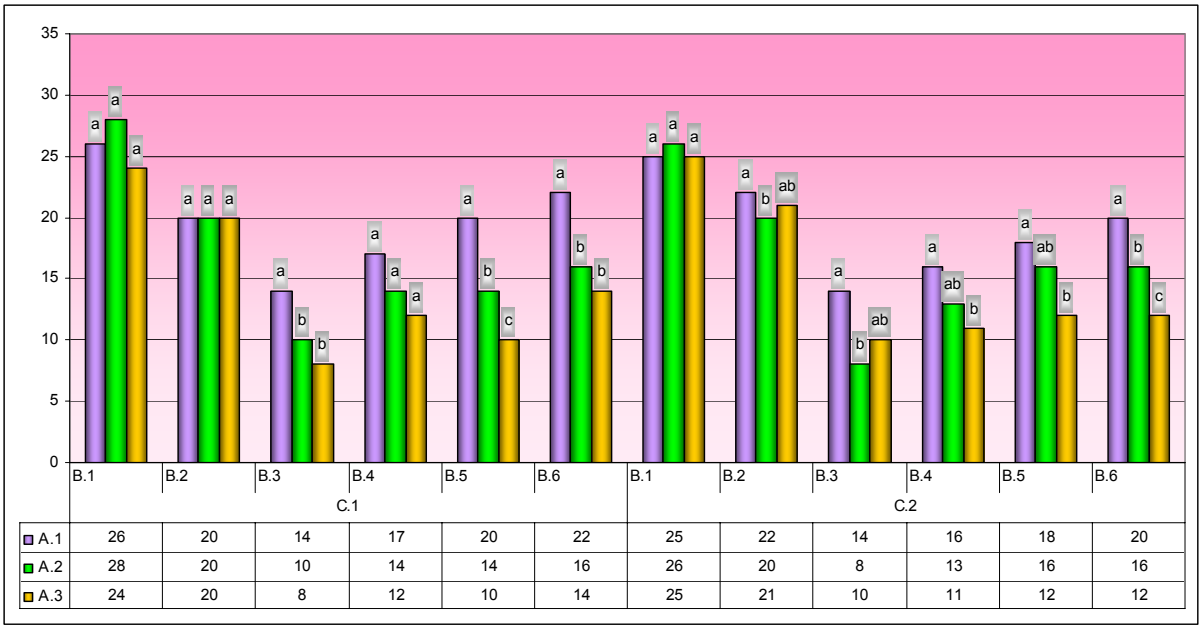
Table 1. The composition of nutritive medium for *in vitro* multiplication phase to *Eustoma grandiflorum*

Composition	V.1	V.2	V.3	V.4	V.5	V.6
Macroelements	MS	MS	MS	MS	MS	MS
Microelements	MS	MS	MS	MS	MS	MS
Vitamins	MS	MS	MS	MS	MS	MS
Glucose (g/l)	40	40	40	40	40	40
Agar	7	7	7	7	7	7
NaFeEDTA (mg/l)	32	32	32	32	32	32
BAP	0,25	0,5	-	-	-	-
TDZ	-	-	0,25	0,5	-	-
Kinetin	-	-	-	-	0,25	0,5

Legend: MS – Murashige-Skoog (1962); BAP – benzylaminopurin; TDZ – tidiazuron.

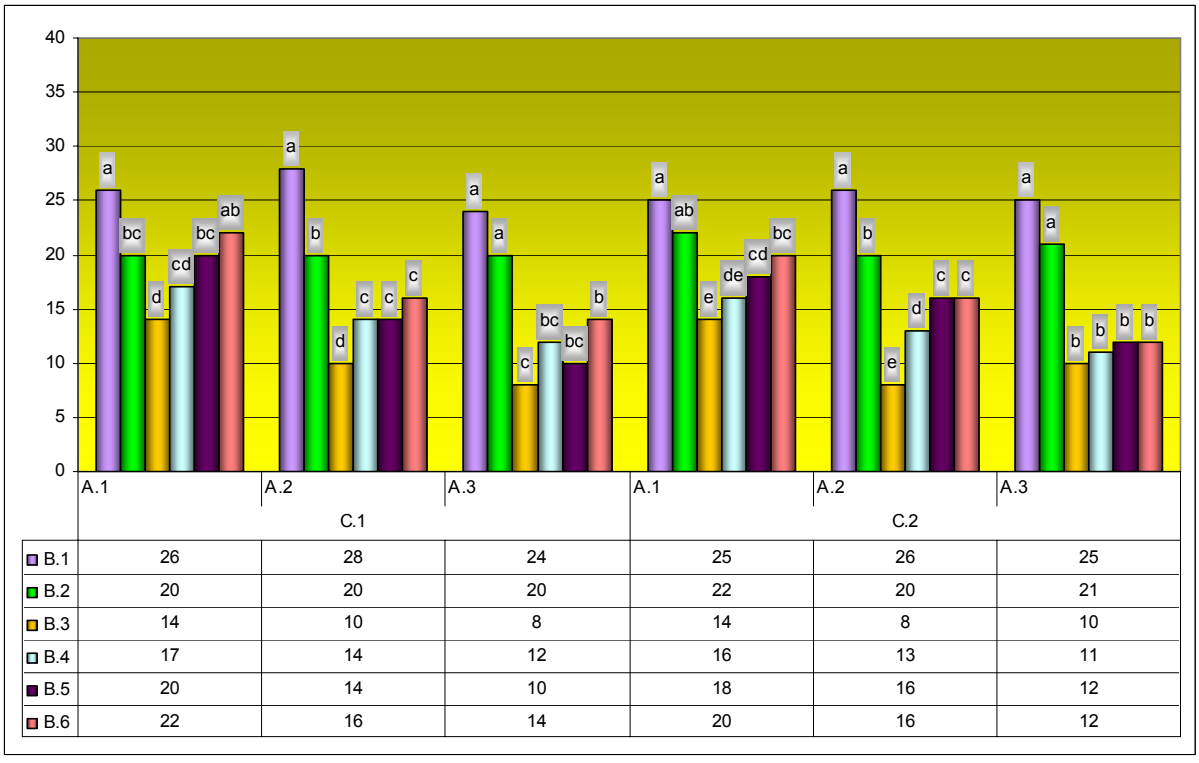
Table 2. The average length of microshoot in function of cultivar, photoperiod and nutritive medium

Cultivar	**Photoperiodism (hours)**	**Variants of nutritive medium (presented in table 1)**					
		1	**2**	**3**	**4**	**5**	**6**
Echo White	16	20,5	21,0	21,5	21,0	20,0	20,0
	12	21,0	21,3	21,8	21,2	20,5	21,0
Magic Blue	16	22,1	26,4	31,6	30,0	28,9	27
	12	24,6	31,6	38,1	34,5	38,1	33
Asenka	16	26,4	30,2	37,6	32,0	39,7	38,0
	12	26,0	30,0	27,8	38,1	39,0	40,1



	B.1	B.2	B.3	B.4	B.5	B.6	B.1	B.2	B.3	B.4	B.5	B.6
A.1	26	20	14	17	20	22	25	22	14	16	18	20
A.2	28	20	10	14	14	16	26	20	8	13	16	16
A.3	24	20	8	12	10	14	25	21	10	11	12	12

Fig. 1. The influence of nutritive medium on *in vitro* multiplication rate



	A.1	A.2	A.3	A.1	A.2	A.3
B.1	26	28	24	25	26	25
B.2	20	20	20	22	20	21
B.3	14	10	8	14	8	10
B.4	17	14	12	16	13	11
B.5	20	14	10	18	16	12
B.6	22	16	14	20	16	12

Fig. 2. The influence of nutritive medium on *in vitro* multiplication rate, for different cultivars

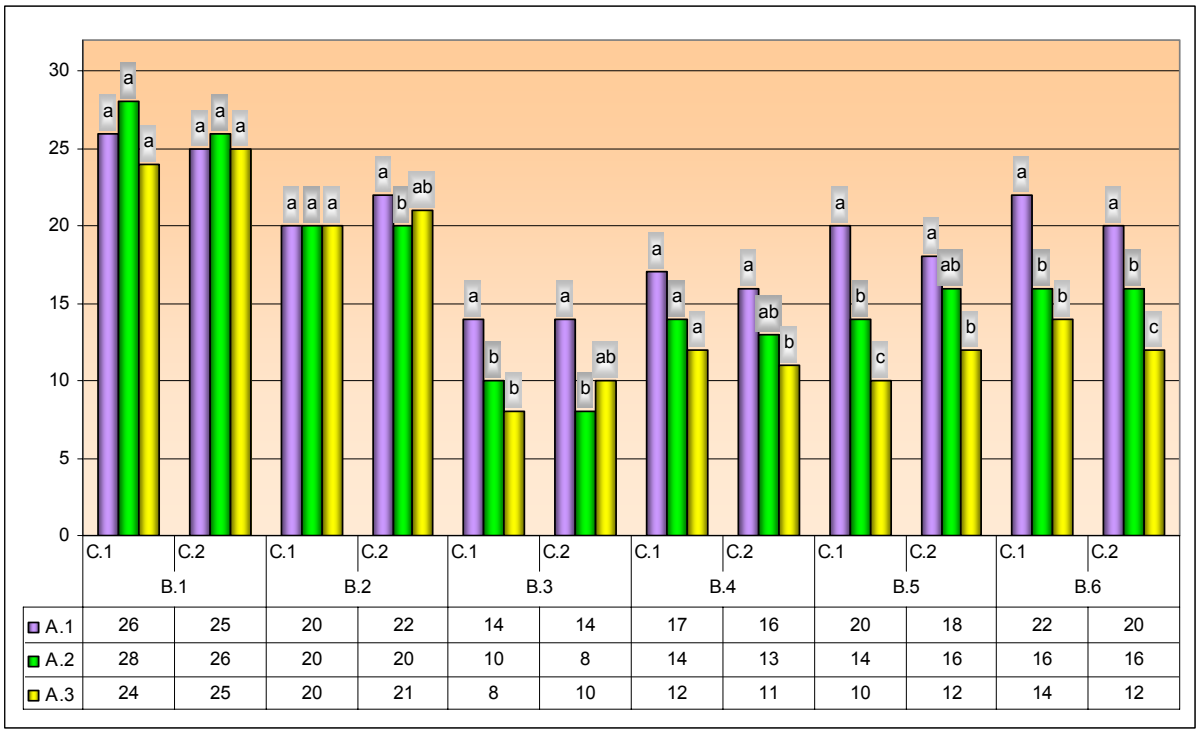


Fig. 3. The influence of photoperiod on *in vitro* multiplication rate

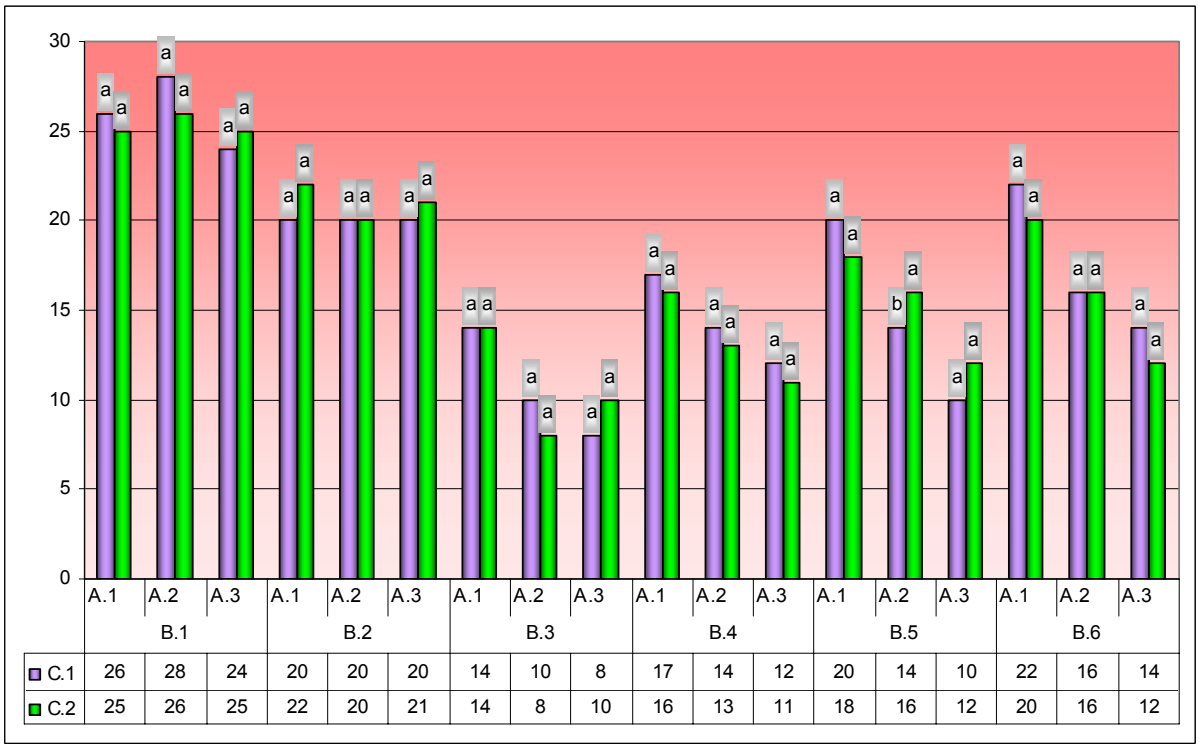


Fig. 4. The influence of photoperiod on *in vitro* multiplication rate, for different cultivars

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STUDIES AND RESEARCHES CONCERNING THE IN VITRO AND IN VIVO CULTURE OF *POLYANTHES TUBEROSA* L. PLANTS

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Keywords: in vitro, in vivo, multiplication, bulbs, culture, flowering

ABSTRACT

Tuberose is one of the most appreciated flower plants in many countries mainly due to its white beautiful flowers accompanied by a very strong and pleasant smell. But to produce flower bulbs is often a difficult and uneasy task and the flowering percentage in field is quite less when classical methods are used.
The aim of our studies was to reduce the production period for flower bulbs and to increase the flowering percentage through biotechnology.
The explants used were buds taken from small bulbs. As tissues culture media (Murashige & Skoog '62) was used and variants were performed on different ratios between NAA, KIN and BAP. The best regeneration was achieved on 0,2 mg/l NAA + 1,5 mg/l KIN + 2,0 mg/l BAP. A percentage of 95 – 100 plants were regenerated and transferred into field to check if the in vitro culture production had any effect on shortening the production period and increasing the flowering percentage.
We recorded a great shortage of bulbs production period from 3 years through classical methods to 1 year by using tissue culture. Also, the flowering percentage of plants regenerated from in vitro produced bulbs was much higher (98 – 100 %) for the plants resulted from bulbs obtained by classical methods.

INTRODUCTION

Tuberose (*Polyanthes tuberosa* L.) is native to Mexico. Flowers are only available in white but they can be single or double-flowered. It is very popular in Romania for the strong fragrance and its essential oils are important components of high-grade perfumes in Southern France and other countries.

Tuberose can be cultivated under different climatic conditions ranging from temperate continental (Cirrito et al., 1982, Toma et al., 1999, Van Dyck, 2002) to Mediterranean (A. Gonzales et al., 1992) and tropical (L. Soetopo and other, 1994, Rameshwar A., 1976, Steenstra et al., 1986) all over the world.

Well known in Europe and America were is mostly used as cut flower in vase, in Asian countries such as Indonesia and India is commonly used as cut flower as well as picked flower especially at festivities associated with ethnic, cultural or religious affairs. Studies on tuberose are mostly concentrated on post harvest handling (Su W.R. et al., 2001, Waithaka K. et al, 2001) cultivation programming, feasibility studies and less data are found on tissue culture for *Polyanthes tuberosa* L. (Ramashwamy et al., 1980, Otsuji K. et al., 1994, Honda Y. et al., 1998, Toma et al., 1998, 2000).

Nowadays is well recognized that the multiplication of various flowers plants through tissues cultures increases rejuvenation and revigourates often the biological material. Based on this observation we decided to study the effect of in vitro micropropagation on bulbs production and flowering of Polyantes tuberose L. plants.

Tuberose is a very appreciated flower in Romania and efforts were concentrated on understanding in details the biology of this flower and finding a proper and efficient technology for cultivation in both tissue culture and fields.

MATERIALS AND METHODS

The biological material used for in vitro cultures initiation was represented by field grown bulbs with diameter of 1,0 – 1,5 cm belonging to a local population of flowers from Bucharest – Romania zone.

From bulbs we took explants represented by buds with 1 – 2 mm length accompanied of one rhizome fragment with same length. After performing several tests we establish that the most suitable moment for explants inoculation was the month of April. The bulbs were carefully washed with water after the protective cover was removed.

Next step was the disinfection of the bulbs under laminar flow with $HgCl_2$ 0,1 % for 20 minutes. To the three washes with sterile water were applied before to make explants and a 70 % ethanol solution was used for final disinfection.

The culture media was Murashige & Skoog '62 supplemented with hormones NAA, KIN and BAP in various concentration and ratios (table 1). As rooting media was used an MS with 0,4 mg/l KIN + 1,0 mg/l IBA + 1,0 mg/l GA_3. Cultures were kept under 16 hours light at 2000 – 2200 lx alternate with 8 hours dark, 20 – 22 °C during the day and 16 – 18 °C during the night and 80 – 85 % UR.

Acclimatization was realized on sand substrate under high relative humidity conditions more than 95 %. After acclimatization the plants were put in pots with soil, they continue to grow until autumn. In the next year bulbs obtained from in vitro regenerated plants were transferred onto field in a comparative scheme along with those obtained by classical methods (table 2).

We analyzed the growth of the plants and the quality of bulbs observing the size by provenience to check the effect of in vitro micropropagation on flower bulbs.

The studies in field were extended in the second year when in the experimental scheme was possible to introduce bulbs from all sizes categories for both variants (table 2). During this year a comparison of growth and flowering between the field variants and the in vitro ones was achieved establishing the effect of in vitro micropropagation on tuberose flowering.

RESULTS AND DISCUSSION

All observations in both studies, in vitro and field culture confirmed the benefic effect of in vitro micropropagation upon solving the difficulties regarding the technology for tuberose production.

A. Results regarding the in vitro culture of tuberose.

Analyzing the percentage of the explants which regenerate neoplantules we recorded a variation between 58,33 % at variant V 4 and 91,66 % at variant V 5 (table 3). The number of neoplantules regenerated per explants, a very important parameter for knowing the final number of in vitro formed bulbs, was between 1,37 at variants V 1 and V 4 and 4,11 at variant V 3 (figure 1).

The growth of tuberose regenerated plants on initiation and rooting media recorded similar values at all five variants of tissues cultures media (tables 4 and 5). Acclimatization of plants was done with very less losses, almost negligible and the growth of plants until rest period had similar values for all variants (table 6).

For each variant the in vitro regenerated plants had formed till rest period between 2,94 and 4,20 bulbs of about 1,0 cm diameter (table 7).

B. Results concerning the in field culture of tuberose.

The first year of in field culture. Our studies have shown that when using as planting material in vitro culture produced bulbs starting in vegetation and the growth of plants was more rapid compared with the field obtained bulbs (tables 8 and 9, figures 2 and 3).

Very significant differences concerning the number and the weight of bulbs formed per plant were recorded between the in vitro obtained bulbs. These formed in only one year of in field culture floriferous bulbs of first quality category (over 3,1 cm diameter) in a very high percentage – over 75 % and also of second quality category (2,6 – 3,0 cm diameter) – about 25 % (table 10).

While comparing the plants regenerated from bulbs with same diameter (about 1,0 cm) multiplied in field they did not form in the first year floriferous bulbs only after 2 – 3 years of in field culture. Thus, the shorting of the production period for floriferous bulbs when we use in vitro obtained bulbs is evident, being necessary only one year of in field culture of these to be able to reach the dimension of a floriferous bulb.

The second year of in field culture. Data recorded in the second year of comparative culture in field showed hat the rejuvenation and revigoration effect of in vitro micropropagation of vegetal material of tuberose was not reflected only in shortage of the production period for floriferous bulbs but also in the flowering capacity level, which was found to be much higher compared with the bulbs obtained by classical methods.

Moreover the growing speed for the in vitro obtained bulbs was much faster and net superior compared with those produced in field (table 11). These superior values of vegetative growing for the plants regenerated from in vitro produced bulbs were found also in case of the flowering percentage of plants (table 12, figures 4 and 5).

The quality of flowering was seen to be influenced by the method of production for the tuberose bulbs (table 13). The number and the quality of bulbs formed at the end of vegetation period reflects the particularity of tuberose plants do not be capable of forming floriferous bulbs in the same year of flowering (table 14).

This impose the production in separate cultures of planting material and as by tissue culture we can reduce at only year the time for obtaining floriferous bulbs.

CONCLUSIONS

Tuberose plants respond very well to in vitro multiplication, the number of regenerated plants and their evolution being in direct relation with the type of tissues cultures media used.

Our purpose was to establish the most suitable tissue culture media for production of a high number of neoplantules regenerated per explants, and we found that MS ’62 supplemented with 0,2 mg/l NAA + 1,5 mg/l KIN + 2,0 mg/l BAP gave the best results.

Acclimatization of in vitro obtained plants was very good and until the rest period plants were able to form between 2,9 and 4,2 bulbs of about 1,0 cm diameter.

Thus, we can conclude that through tissues cultures the planting material of tuberose was juvenile and the practical effect was expressed by a great shortage of period for floriferous bulbs production to one year and a very significant increase of the flowering percentage, almost 100 %.

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Tables

Table 1. The experimental variants for in vitro biological material production

Variants	Growing hormones (mg/l)		
	NAA	KIN	BAP
V 1	0,2	0,5	2,0
V 2	0,2	1,0	2,0
V 3	0,2	1,5	2,0
V 4	0,2	2,0	2,0
V 5	2,0	0,5	2,0

Table 2. The experimental variants for the first year of comparative culture in field

Variants	The origin of bulbs	The age of bulbs (years)	The diameter of bulbs (cm)
V 1	vitro	0,3	1,0
V 2	field	1	1,0
V 3	field	2	1,1 – 2,0
V 4	field	3	2,1 – 3,0

Table 3. The experimental variants for the second year of comparative culture in field

Variants	The origin of bulbs	The age of bulbs (years)	The diameter of bulbs (cm)
V 1	vitro	1,0	> 3,1
V 2	vitro	1,0	2,6 – 3,0
V 3	vitro	1,0	1,6 – 2,5
V 4	vitro	0,3	1,0 – 1,5
V 5	field	3,0	> 3,1
V 6	field	2,0	2,6 – 3,0
V 7	field	2,0	1,6 – 2,5
V 8	field	1,0	1,0 – 1,5

Table 4. The explants evolution on the initiation culture media

Variants	Regenerated explants (%)	Plantlets regenerated/explant	Length of plants (cm)	Number of leaves
V 1	88,33	1,37	4,38	0,75
V 2	86,66	1,99	3,77	0,59
V 3	86,66	4,11	3,87	0,61
V 4	58,33	1,37	2,59	0,32
V 5	91,66	1,44	4,46	0,78

Table 5. The growth of regenerated plantlets on rooting on rooting media and behaviour to acclimatization

Variants	Length of plants (cm)	Number of leaves	Number of roots	Length of roots (cm)	Acclimatized plants (%)
V 1	9.00	2,20	4,23	2,55	97,26
V 2	8,43	2,20	4,43	2,39	96,57
V 3	6,90	1,93	3,76	2,47	98,10
V 4	5,93	1,50	2,90	2,59	92,06
V 5	9,06	1,90	3,43	2,26	100,00

Table 6. The growth of acclimatized plants from plantation to pots until rest period

Variants	Number of leaves	Length of leaves (cm)	In vitro multiplication coefficient
V 1	9,70	6,73	1,13
V 2	9,50	6,84	1,56
V 3	9,96	7,75	3,40
V 4	8,36	6,78	0,63
V 5	9,93	7,72	1,32

Table 7. The parameters of the bulbs obtained from in vitro regenerated plants

Variants	Number of bulbs per plants	The bulbs multiplication coefficient	Diameter of bulbs (cm)	Weight of bulbs (g)
V 1	3,53	16,00	1,15	3,35
V 2	3,26	20,93	1,11	3,34
V 3	4,20	57,20	1,17	3,37
V 4	2,94	7,46	1,13	3,11
V 5	4,14	21,69	1,11	3,33

Table 8. The dynamics of bulbs vegetation started in the first year of comparative culture in field

Variants	Bulbs vegetation started (%) after:			
	3 weeks	4 weeks	5 weeks	6 weeks
V 1	42,85	94,20	100,00	100,00
V 2	25,71	42,85	85,71	100,00
V 3	25,71	40,00	82,85	100,00
V 4	22,85	57,14	100,00	100,00

Table 9. The growth of plants in the first year of in field culture

Variants	Number of leaves				Length of leaves (cm)			
	June	July	August	September	June	July	August	September
V 1	5,81	32,43	57,85	63,12	10,60	36,75	43,62	46,80
V 2	3,30	18,93	31,34	39,40	10,56	28,20	30,54	32,10
V 3	5,33	21,54	38,00	48,73	10,83	29,12	32,30	32,82
V 4	9,64	30,55	53,43	58,51	11,36	30,10	32,35	33,22

Table 10. The number and the weight of bulbs formed by plants in the first year of field culture

Variants	Number of bulbs of size:				Weight of bulbs of size (g):			
	I	II	III	IV	I	II	III	IV
V 1	0,75	0,25	3,55	13,84	50,00	29,75	9,48	3,38
V 2	0,00	0,25	3,82	12,12	-	25,00	6,00	2,38
V 3	0,50	0,35	3,34	10,57	35,50	27,55	6,14	2,45
V 4	0,65	0,35	3,40	11,84	39,50	28,45	6,10	2,73

Table 11. The growth of plants in the second year of in field culture

Variants	Number of leaves				Length of leaves (cm)			
	June	July	August	September	June	July	August	September
V 1	11,6	38,2	76,9	87,8	12,57	36,40	46,43	49,54
V 2	10,8	25,7	51,5	58,4	10,90	28,70	37,30	37,97
V 3	9,1	20,2	40,3	46,5	9,57	27,35	31,25	33,27
V 4	6,1	31,4	52,7	63,5	10,20	34,57	40,10	43,12
V 5	8,9	28,6	59,5	68,8	11,80	32,80	38,47	42,87
V 6	7,5	18,9	39,5	47,6	10,20	22,70	31,72	33,20
V 7	6,3	16,4	30,7	36,2	9,10	20,24	27,48	28,12
V 8	4,1	13,8	25,2	31,4	8,42	20,72	26,24	27,12

Table 12. The growth of floral stems and the dynamics of flowering percentage in the second year of field culture

Variants*	Flowered plants (%)			Length of flower stems (cm)			Length of inflorescences (cm)		
	July	August	Sept.	July	August	Sept.	July	August	Sept.
V 1	88,6	97,2	97,2	21,4	90,7	112,3	2,7	25,3	37,4
V2	37,2	44,3	45,8	13,6	70,1	98,8	1,5	14,2	27,3
V 5	64,3	68,6	70,0	15,8	70,7	106,2	2,0	14,2	30,8
V 6	10,0	20,0	22,8	10,0	57,4	93,7	0,5	7,1	24,5

* only the variants with flowered bulbs

Table 13. The dynamics of flowers growth and their quality

Variants*	Number of flowers in inflorescence			Length of flower (cm)			Diameter of flowers (cm)		
	July	August	Sept.	July	August	Sept.	July	August	Sept.
V 1	32,0	32,0	32,0	0,9	3,1	5,5	0,7	2,3	5,2
V2	24,5	24,5	24,5	0,6	1,8	5,4	0,5	1,5	4,4
V 5	26,0	26,0	26,0	0,7	2,7	5,3	0,4	1,6	4,6
V 6	23,0	23,0	23,0	0,3	1,4	4,8	0,2	1,0	4,1

* only the variants with flowered bulbs

Table 14. The number and the weight of bulbs formed by plants in the second year of field culture

Variants	Number of bulbs of size:				Weight of bulbs of size (g):			
	I	II	III	IV	I	II	III	IV
V 1	0,05	0,25	7,4	12,4	55,00	31,60	9,85	2,84
V 2	0,45	0,05	3,8	8,9	57,20	30,00	8,34	2,75
V 3	0,45	0,30	5,4	10,5	40,60	28,70	7,43	2,82
V 4	0,75	0,25	3,4	14,2	51,00	30,00	9,50	3,36
V 5	0,20	0,15	3,3	7,4	50,40	26,66	5,84	2,65
V 6	0,60	0,15	2,9	6,5	45,50	28,30	5,40	2,22
V 7	0,25	0,40	3,8	12,4	38,40	26,80	6,80	2,34
V 8	0,00	0,25	4,3	12,2	-	24,30	6,12	2,15

Figures

Figure 1. The regenerated plantlets on V 3 media culture

Figure 2. Plant obtained from bulbs regenerated in vitro

Figure 3. Plant obtained from bulbs regenerated in field

Figure 4. The flowering of the plants obtained from bulbs regenerated in vitro

Figure 5. The flowering of the plants obtained from bulbs regenerated in field

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RESEARCHES CONCERNING THE PRODUCTION BY CUTTING OF *OPUNTIA FICUS-INDICA L, ZYGOCACTUS TRUNCATES K. SCHUM AND MAMMILLARIA PROLIFERA HAW.* PLANTS

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Keywords: cutting, substrate, rooting, cactus

ABSTRACT

It is very well known that together the climatic conditions the rooting of the cuts is strongly influenced by the type of substrate.
The biological material used in our experience was represented by cuts of stem fragments from *Opuntia ficus indica, Zygocactus truncates, mammillaria prolifera.* We used as substrates sand, perlite and dark peat, in unitary and binary combinations.
The percent of rooting was varied between 70 and 100 %, depending on type of substrate and specie. The best substrate for each species was sand (100 % the percent of rooting) while on the dark peat and its combination the percent of rooting was which 30 % smaller.
Among the species the cuts of *Opuntia* were rooted better on all type of substrates while at *Mammilaria* the rooting of cuts was inferior.

INTRODUCTION

The great variability of the form, size, colors and aspect made from cactus very especially plants in the flower assortment.

The three species used in our experience and also, the substrates are very well known and the results of our studies may be practice largely by the cactus aimed.

MATERIALS AND METHODS

We used cuts of stem fragment from each of species (figure 1).

The substrates of rooting were represented by sand, perlite and dark peat in unitary and binary combinations (table 1).

For each variants and each species we used 40 cuts, distributed in 4 repetitions of 10 cuts.

The cuts were taken from mother plants at middle of March. Before the planting on the substrate, the cuts were kipping two weeks in dried room for an easy dehydration.

In the beginning of June the rooted cuts were pull out from substrate and we made it's the following observations:

- the number and the length of principal roots;
- the number of secondary roots.

RESULTS AND DISCUSSION

We observed from the table 2 that the best results of rooting (100 % percent of rooting) were obtained on sand substrate.

The cuts of *Opuntia* and *Zygocactus* were also well rooted on perlite substrate.

We observed that the binary combinations between the principal substrates determined an inferior rooting of the cuts for all the species.

Concerning the quality of rooting the results are different depending both of the species and also of substrate (figures 2 – 7).

From table 3 we observed that at *Opuntia* the number of principal roots varied between 4,00 at variant V 1 and 5,00 at variants V 4 and V 6.

The length of principal roots varied between 5,82 cm at variant V 3 and 18,13 cm at variant V 5.

Concerning the number of secondary roots we observed an variation between 61,40 at variant V 3 and 91,80 at variant V 5.

Comparing the results we observed that the dark peat and its combinations determined more inferior results both for the percent and also for the quality of rooting.

At *Zygocactus* we observed from table 4 that the number of principal roots varied between 1,60 at variant V 6 and 4,00 at variant V 2. The length of principal roots at *Zygocactus* varied between 1,91 at variant V 4 and 2,90 cm at variant V 5.

Concerning the secondary roots we observed a variation between 5,00 at variant V 6 and 22,80 at variant V 2. We easy observed that the sand and the perlite had a favorable impact upon the number of secondary roots at *Zygocactus*.

Also at *Zygocactus* the dark peat determined inferior results concerning the quality of cuts rooting.

At *Mammillaria* the number of principal roots varied between 2,60 at variants V 1 and V 5 and 4,00 at variant V 2 (table 5). The length of principal roots is not so variable.

But the number of secondary roots varied between 4,00 at variant V 4 and 12,40 at variant V1. We observed that also at *Mammillaria* the dark peat and its combination gave the more inferior results concerning the quality of cuts rooting.

CONCLUSIONS

The results of our experiences show that the best substrate for cuts rooting was sand, both for the percent of rooting and also for the quality of roots.

The perlite was also a good substrate for *Opuntia* and *Zygocactus* but not for *Mammillaria*.

The dark peat, single and in its combinations is not recommended as substrate for cuts rooting of *Opuntia, Zygocactus* and *Mammilaria*, the percent of rooting and the quality of roots being inferior.

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Tables

Table 1. The experimental variants

Variant	Substrate
V 1	sand
V 2	perlite
V 3	dark peat
V 4	½ sand + ½ perlite
V 5	½ perlite + ½ dark peat
V 6	½ sand + ½ dark peat

Table 2. The variation of cuts rooting percent

Variant	Cuts rooting percent (%)		
	Opuntia ficus-indica	***Zygocactus truncatus***	***Mammillaria prolifera***
V 1	100,0	100,0	100,0
V 2	100,0	100,0	80,0
V 3	87,5	90,0	80,0
V 4	100,0	90,0	90,0
V 5	87,5	80,0	90,0
V 6	90,0	80,0	70,0

Table 3. The variation of quality of roots at *Opuntia ficus-indica*

Variant	No. of principal roots	Length of principal roots (cm)	No. of secondary roots
V 1	4,00	9,11	86,40
V 2	4,60	12,07	80,20
V 3	4,75	5,82	61,40
V 4	5,00	8,64	86,00
V 5	4,60	18,13	91,80
V 6	5,00	9,09	64,60

Table 4. The variation of quality of roots at *Zygocactus truncatus*

Variant	No. of principal roots	Length of principal roots (cm)	No. of secondary roots
V 1	3,00	2,79	20,40
V 2	4,00	2,27	22,80
V 3	3,20	1,57	9,40
V 4	3,60	1,91	9,40
V 5	3,40	2,90	9,20
V 6	1,60	2,15	5,00

Table 5. The variation of quality of roots at *Mammilaria prolifera*

Variant	No. of principal roots	Length of principal roots (cm)	No. of secondary roots
V 1	2,60	1,93	12,40
V 2	4,00	1,29	8,60
V 3	2,80	1,61	7,80
V 4	3,20	1,36	4,00
V 5	2,60	2,33	9,40
V 6	3,00	1,29	8,80

Figures

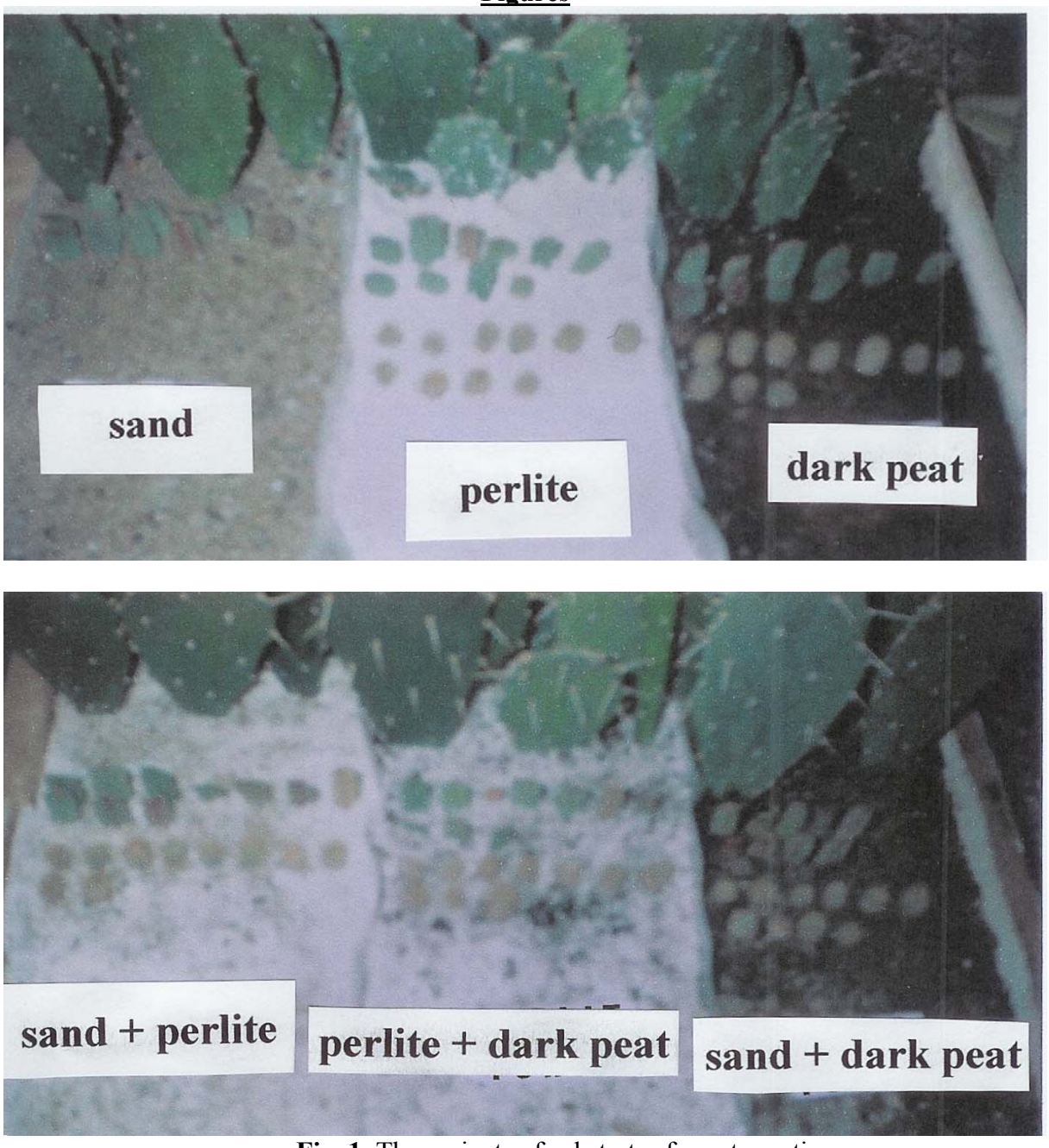


Fig. 1. The variants of substrates for cuts rooting

Fig. 2. The cuts rooting on sand

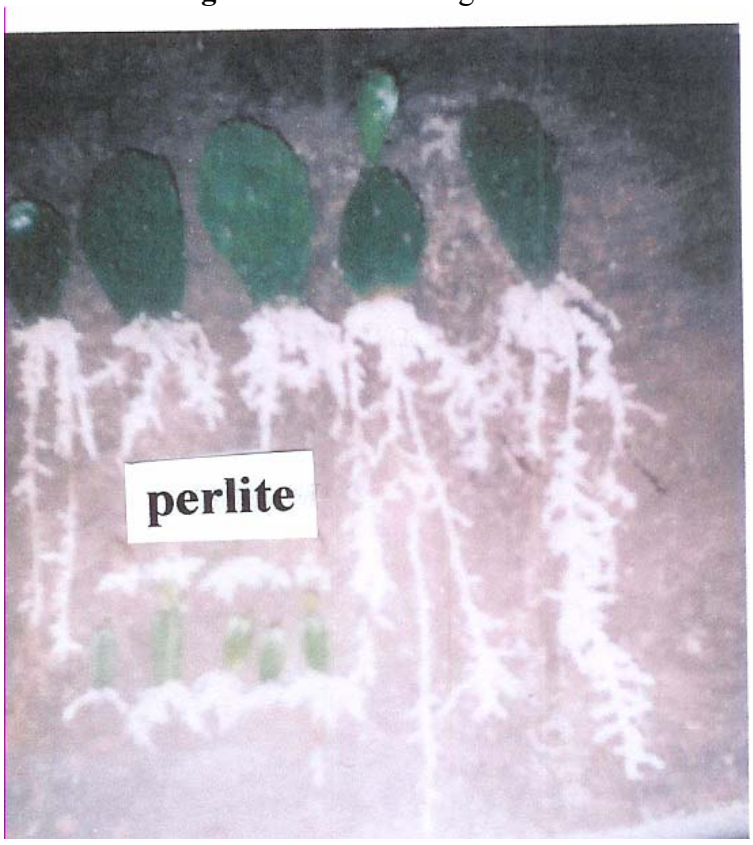


Fig. 3. The cuts rooting on perlite

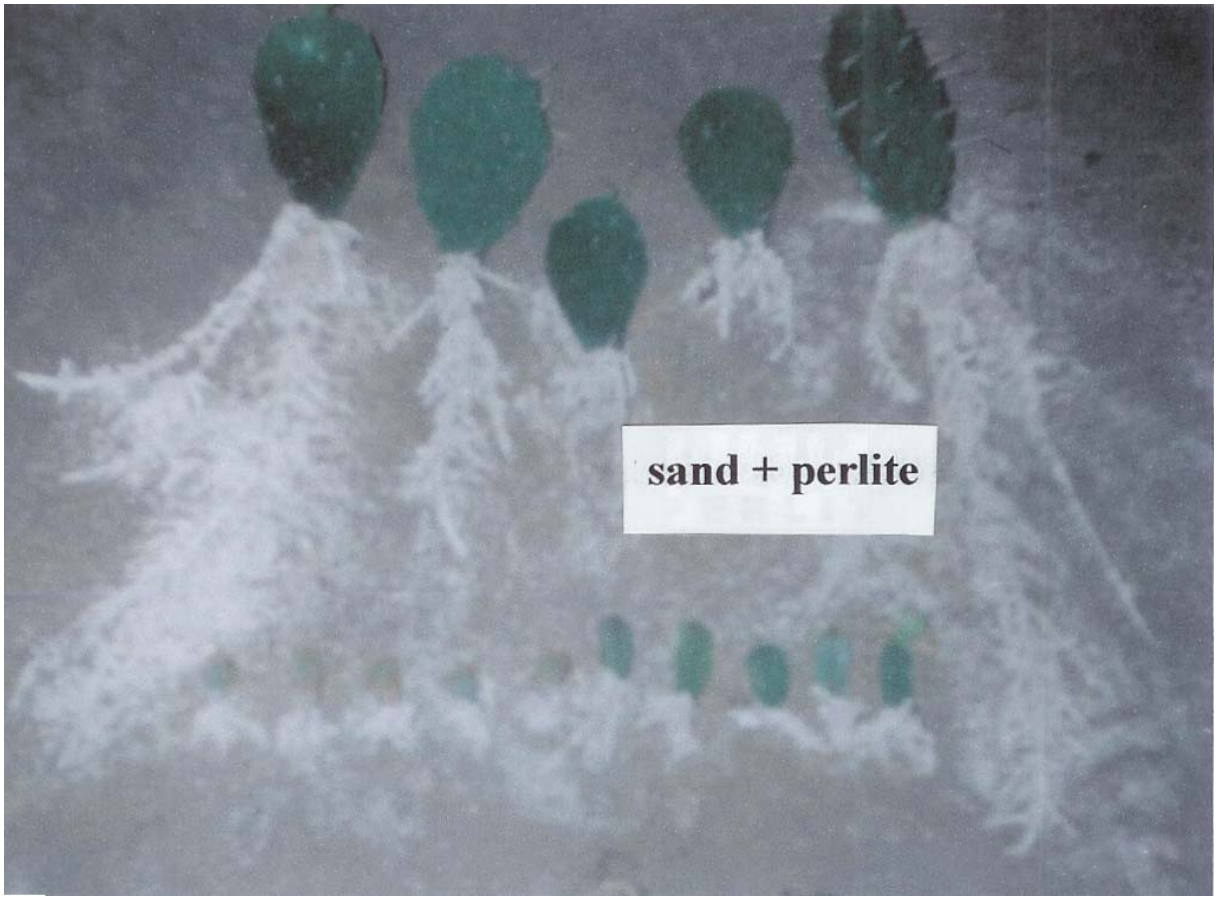


Fig. 4. The cuts rooting on sand + perlite substrate

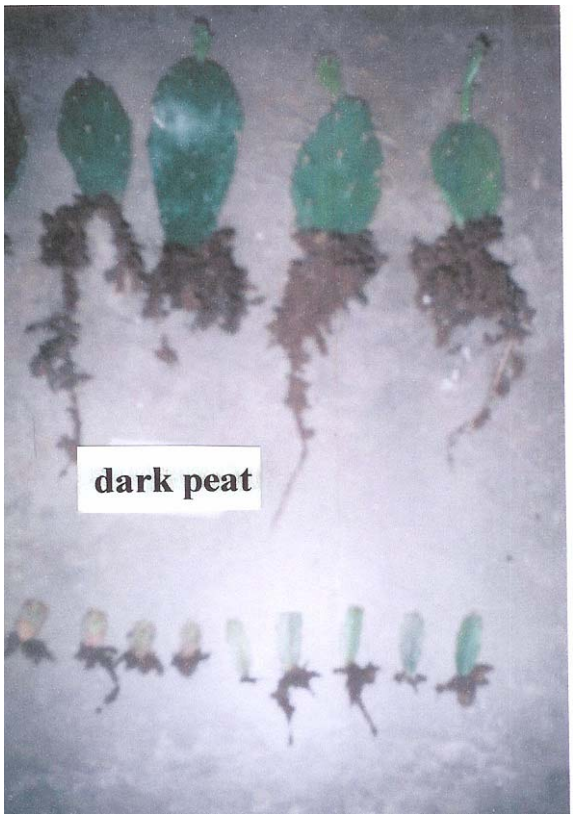
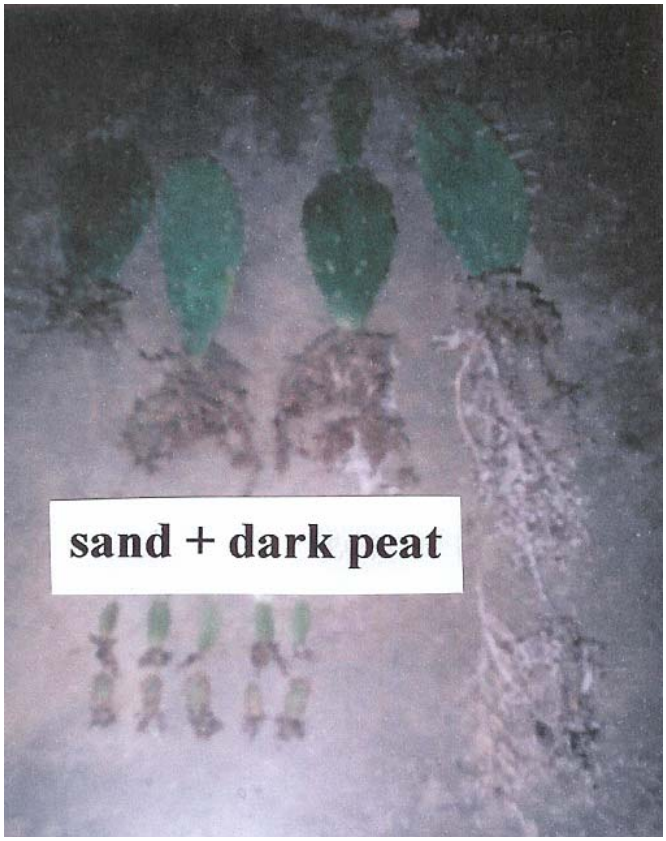


Fig. 5. The cuts rooting on dark peat



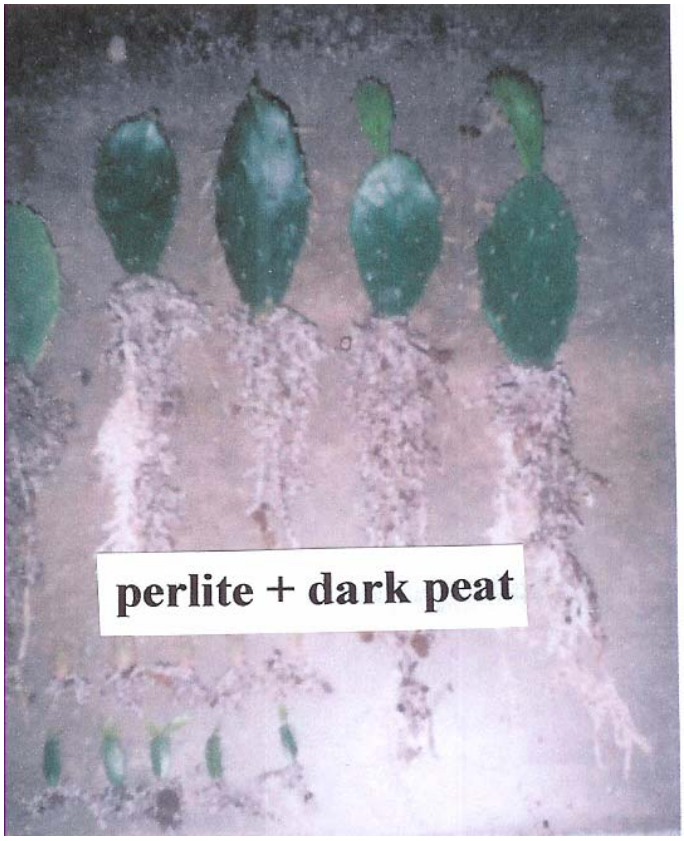


Fig. 6. The cuts rooting on dark peat + sand and dark peat + perlite

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THE INFLUENCE OF THE SORTS OF CUTTINGS AND OF THE PHYTO-BIO-ENERGETIC STIMULATOR ON THE RHISOGENESIS AT CONIFER TREES

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Key words: sort of cuttings, rhisogenesis, conifer trees, Phyto-bio-energized water

ABSTRACT

The studies undertaken have outlined the fact that the ornamental conifer cuttings strike root for more than 65% provided they are rooted with the heel. Also, the rhisogenesis is favorably influenced if the cuttings are watered with phyto-bio-energized water. The effects of such watering in our present study are equal to a percent of 12-18%, which stands for the recommendation of using phyto-bio-energized water in the practices of planting/rooting the conifer cuttings.

INTRODUCTION

Most bush conifer trees are considered to enjoy a high “landscape” appreciation value due to the shape of their crown, the colours of the leaves, the manner of growth, of the various possibilities of use etc. (Iliescu, 2003, Zaharia 1999).

Due to this value, the conifer trees are being used to embellish private or public green spots, in various landscape compositions specific to each tip of arrangement (individual, group, hedge etc.) (Cuisance, 1972; Zaharia, 2003).

The frequency of ornamental conifer trees in the green areas and their ornamental values greatly depends on the quality of the planting material.

The nurseries which produce ornamental conifers use the vegetative method of multiplication by means of cuttings propagation (Benzie, 1963). Using this method one can ensure the exact transmittal of the productive and especially of decorative characteristics.

The results of the rooting depend on the biologic material, on the manner of shaping the cuttings, as well as on the factors used during the rooting process (Zaharia, 2007).

MATERIAL AND METHOD

For our experiments we have used cuttings taken from well-developed plants of *Chamaecyparis lawsoniana* cv. *Elwoodii, Chamaecyparis pisifera, Thuja orintalis* cv. *Aurea, Thujopsis dolobrata.*

The cuttings were shaped in three manners, these cuttings being known in the horticultural practices as "simple cuttings", "heeled cuttings" and "hooked cuttings". This aspect constituted one of the influencing factors of the rhisogenesis.

The second influencing factor was the water used for watering, which was of two types: Plain water from the town’s running water supply and water with phyto-bio-energetic qualities.

For each species separate experiments were organized. The growths used for the cuttings were 3-4 years old, while the material used for the rooting of the cuttings was formed by equal amounts of peat and pearl stone.

The number of variant cuttings was 90 and in repetition 30.

At the end of the period of rooting a series of observations and measurements were realized aiming at determining the degree of rooting and the quality of the rooting process with the cuttings.

The primary data were calculated and statistically processed reaching thus the average values, the limit differences and their significance.

The results are presented in the tables and they are interpreted in the text. The conclusions are mentioned separately.

RESULTS AND DISCUSSIONS

Analyzing the results obtained and mentioned in table nr. 1, it can be noticed that in the case of the four species taken under study the results of rooting the "hooked cuttings" gave vary small values varying between 5.2% and 35.2%.

In the case of the other methods, simple and heeled cuttings, the results have much higher values, between 63.8% (experiment II) and 98.1% (experiment IV).

A generally valid observation is the fact that the cuttings on which phyto-bio-energized water was used recorded greater values at the rooting than the variants watered with plain water.

If the results obtained are compared to the witness variant (simple cuttings watered with plain water) in the case of every experiment it was observed that the simple cuttings watered with phyto-bio-energized water and the heeled cuttings irrespective of the type of water used exceed numerically and in percentage the witness of the rooted cuttings.

The situation is wholly different in the case of the hooked cuttings, irrespective of the type of water used. The results obtained are smaller as compared to the witness variant.

The analysis of the variance established the fact that the differences from the witness are significantly positive in the case of simple cuttings watered with phyto-bio-energized water (experiments I and IV) and with all the experiments in the case of heeled cuttings watered with plain water. The heeled cuttings watered with phyto-bio-energized water exceed the values of the witness in all the experiments, the differences being positive, very significant.

In the case of hooked cuttings, irrespective of the water used, the differences from the witness are negative and very significant. The differences observed between the witness and the variants of the experiments are due to the cumulated influence on the rhisogenesis of the manner of shaping and type of water used.

We presented in the table nr. 2 the results of the experiments from the standpoint of the influence of the manner of shaping cuttings on the rooting process.

Analyzing the results of the rooting it was noticed that the simple and heeled cuttings obtain close values between 67.7% and 96.0%. Between these limits with *Thujopsis dolobrata* the difference as compared to the witness is positive and distinctly significant, while with *Chamaecyparis lawsoniana Elwoodii* the difference is significantly positive.

The results obtained at the rooting of the conifers cuttings under the influence of the type of cuttings.

In the case of hooked cuttings with all the species the rooting is much under the value of the witness, the percentage of rooting not exceeding the value of 20.6 while as compared to the witness the percentage of the rooted cuttings is of 19.8-29.24. The differences as compared to the witness are negative in all the experiments with very significant values.

In the table 3 we presented the results of the rooting as influenced by the type of water used. One can observe that in all the experiments the use of phyto-bio-energized water determined a better rooting as compared to the witness. The differences are significantly

positive, except for the *Thuja orientalis* where the difference from the witness is positive in a distinctly significant degree.

The cuttings watered with phyto-bio-energized water, besides the fact that have taken roots in greater number, have formed a greater number of roots in the ground. Fig. 1 and 2.

CONCLUSIONS AND RECOMMENDATIONS

The ornamental coniferae from the species *Thuja orientalis Chamaecyparis lawsoniana si Chamaecyparis pisifera,* can be propagated through cuttings with very different results depending on the manner of shaping of the cuttings and on other treatments applied.

Good results can be obtained with the simple cuttings, the percentage varying between 67.6% and 88.4%. At the heeled cuttings the results are very good, the percentage of rooting being of 79.9% and 96.0%. The cuttings shaped according to the hook method (hooked cuttings) obtained very poor results, the rooting percentage vary between 17.6 and 20.6.

At the rooting of the conifer cuttings from the above mentioned species it was observed that the use of bio-energized water has a positive influence. The results obtained in rooting the cuttings are positive in all the cases, exceeding the witness by 19.5-34.2%.

As a consequence of the results obtained in the research we carried out, we recommend the use of simple or heeled cuttings and of phyto-bio-energized water during the rooting process.

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Figures

Fig. 1. *Thujopsis dolobrata* – rooted cuttings
a. the effect of phyto-bio-energized water; b. the effect of plain water

Fig. 2. *Thuja orientalis* – rooted cuttings
a. the effect of phyto-bio-energized water; b. the effect of plain water

Tables

Table 1. Experimental results obtained at the rooting conferee cuttings under the influence of the type of cuttings and watering with phyto-bio-energized water

Experiment	Variant	Rooted cuttings			± d	Signific. of the difference
		no. out of 90	%	Mt		
I	*Thuja orientalis* cv. *Aurea*					
	1. Simple cuttings + plain water (Mt)	62.1	69.0	100.0	-	-
	2. Simple cuttings + phyto-bio-energized water	75.3	83.7	121.3	13.2	*
	3. Heeled cuttings + plain water	74.6	82.9	120.1	12.5	*
	4. Heeled cuttings + phyto-bio-energized water	83.6	92.9	134.6	21.5	***
	5. Hooked cuttings + plain water	5.2	5.8	9.3	-56.9	ooo
	6. Hooked cuttings + phyto-bio-energized water	31.7	35.2	51.1	-30.4	ooo
		DL 5% = 12.8 DL 1% = 17.3 DL 1% = 20.1				
II	*Thujopsis dolobrata*					
	1. Simple cuttings + plain water (Mt)	57.4	63.8	100.0	-	-
	2. Simple cuttings + phyto-bio-energized water	64.2	71.3	111.9	7.1	-
	3. Heeled cuttings + plain water	71.4	79.3	124.4	14.0	*
	4. Heeled cuttings + phyto-bio-energized water	81.6	90.7	142.2	24.2	***
	5. Hooked cuttings + plain water	8.3	9.2	14.5	-49.1	ooo
	6. Hooked cuttings + phyto-bio-energized water	27.4	30.4	47.7	-30.0	ooo
		DL 5% = 13.1 DL 1% = 18.2 DL 1% = 21.6				
III	*Chamaecyparis lawsoniana Elwoodii*					
	1. Simple cuttings + plain water (Mt)	58.4	64.9	100.0	-	-
	2. Simple cuttings + phyto-bio-energized water	65.2	72.4	111.7	6.8	-
	3. Heeled cuttings + plain water	69.8	77.5	119.5	11.4	*
	4. Heeled cuttings + phyto-bio-energized water	81.3	90.3	139.2	22.9	***
	5. Hooked cuttings + plain water	4.7	5.2	8.1	-53.7	ooo
	6. Hooked cuttings + phyto-bio-energized water	26.5	29.4	45.4	-31.9	ooo
		DL 5% = 10.4 DL 1% = 15.6 DL 1% = 19.7				
IV	*Chamaecyparis pisifera*					
	1. Simple cuttings + plain water (Mt)	73.6	81.8	100.0	-	-
	2. Simple cuttings + phyto-bio-energized water	85.6	95.1	116.3	12.0	*
	3. Heeled cuttings + plain water	84.5	93.9	114.8	10.9	*
	4. Heeled cuttings + phyto-bio-energized water	88.3	98.1	120.0	14.7	**
	5. Hooked cuttings + plain water	7.5	8.3	10.2	-66.1	ooo
	6. Hooked cuttings + phyto-bio-energized water	24.1	26.8	32.8	-49.5	ooo
		DL 5% = 10.9 DL 1% = 13.2 DL 1% = 18.6				

Table 2. The results obtained at the rooting of the conifers cuttings under the influence of the type of cuttings

Experiment	Variant	Rooted cuttings			± d	Signific. of the difference
		nr. out of 90	%	Mt		
I	*Thuja orientalis* cv. *Aurea*					
	1. Simple cuttings	68.7	76.3	100.0	-	-
	2. Heeled cuttings	71.9	79.9	104.6	3.2	-
	3. Hooked cuttings	18.5	20.6	26.9	-50.2	ooo
		DL 5% = 7.6		DL 1% = 12.8		DL 1% = 18.6
II	*Thujopsis dolobrata*					
	1. Simple cuttings	60.8	67.6	100.0	-	-
	2. Heeled cuttings	76.5	85.0	125.8	15.7	**
	3. Hooked cuttings	17.9	19.9	29.4	-42.9	ooo
		DL 5% = 9.4		DL 1% = 14.9		DL 1% = 20.1
III	*Chamaecyparis lawsoniana Elwoodii*					
	1. Simple cuttings	61.8	68.7	100.0	-	-
	2. Heeled cuttings	75.6	84.0	122.3	13.8	*
	3. Hooked cuttings	15.6	17.3	25.2	-46.2	ooo
		DL 5% = 10.1		DL 1% = 17.0		DL 1% = 21.6
IV	*Chamaecyparis pisifera*					
	1. Simple cuttings	79.6	88.4	100.0	-	-
	2. Heeled cuttings	86.4	96.0	108.5	6.8	-
	3. Hooked cuttings	15.8	17.6	19.8	-63.8	ooo
		DL 5% = 8.9		DL 1% = 14.8		DL 1% = 18.6

Table 3. The experimental results obtained at the rooting of the conifer cuttings under the influence of using phyto-bio-energized water (the "Dinca" effect)

Experiment	Variant	Rooted cuttings			± d	Signific. of the difference
		no. out of 90	%	Mt		
I	*Thuja orientalis* cv. *Aurea*					
	1. Plain water	47.3	52.6	100.0	-	-
	2. Phyto-bio-energized water	63.5	70.6	134.2	16.2	**
		DL 5% = 9.8		DL 1% = 15.6		DL 1% = 20.1
II	*Thujopsis dolobrata*					
	1. Plain water	45.7	50.8	100.0	-	-
	2. Phyto-bio-energized water	57.7	64.1	126.2	12.0	*
		DL 5% = 10.2		DL 1% = 16.1		DL 1% = 21.8
III	*Chamaecyparis lawsoniana Elwoodii*					
	1. Plain water	44.3	49.2	100.0	-	-
	2. Phyto-bio-energized water	57.7	64.1	130.2	13.4	*
		DL 5% = 8.9		DL 1% = 14.3		DL 1% = 19.6
IV	*Chamaecyparis pisifera*					
	1. Plain water	55.2	61.3	100.0	-	-
	2. Phyto-bio-energized water	66.0	73.3	119.5	10.8	*
		DL 5% = 9.1		DL 1% = 15.4		DL 1% = 19.8

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FRUIT GROWING & TECHNOLOGY

RESEARCHES CONCERNING LEAD AND CADMIUM CONTENTS IN FRUITS

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Keywords: pollution, plum, strawberry, heavy metal

ABSTRACT

Lead and cadmium are among the most abundant heavy metals that are particularly toxic and ingestion of contaminated vegetables and fruits may create health problems. The concentration of these heavy metals that are present in plums and strawberries were determined using electrothermal atomic absorption spectrometry (ETAAS). Essentially, the heavy metals have only become a focus of public interest since analytical techniques have made it possible to detect them even in very small traces. The results were expressed as mg/kg fresh weight. The lead content in analyzed fruits is between 0,02 - 0,047mg/kg for plums and 0,006 - 0,038 mg/kg for strawberries. According with limits set by Commission Regulation 466/2001, these fruits are safe to be consumpted. The cadmium content for plums ranges between 0,007 – 0,023 mg/kg and for strawberries ranges between 0,016-0,138 mg/kg. One variety of strawberry presents cadmium concentration 2,78 times higher than safe limit.

INTRODUCTION

Pollution of the natural environment produced by heavy metal is a worldwide problem because these metals are indestructible and most of them have toxic effects on living organisms, when they exceed a certain concentration (Harte et al., 1991). This situation determined the researchers from all over the world to study the pollution with heavy metals in air, water, and foods to avoid their harmful effects (Zakrzewski, 1991; Kennish, 1992; Oehme, 1989), and to determine their permissibility for human consumption. Vegetables and fruits are the starting link of the food chain, which is the principal source of heavy metals for animals and humans.

Plants can contain heavy metals from their presence in the soil (including contamination of the plant material with soil), water or air (McLaughlin, 1999). The accumulation of metals varies greatly both between species and cultivars. Generally plants translocate larger quantities of metals to their leaves than to their fruits or seeds (Callow, 1995; Chang, 1974; Dudka et al., 1999; Ellen et al., 1990).

Lead and cadmium are elements not essential to plant, animals ar human. Their presence in living organisms is harmful, undesired and present no physiological function for human body (Neumann et al., 1990). Both of them are cumulative poisons.

Cadmium can disturb kidney functions, and some studies indicate a cancerous effect (Merian 1984). It is now known that the itai-itai sickness in Japan is a result of the regular consumption of highly cadmium contaminated rice.

Sources of cadmium exposure are cigarette smoking, ingestion of food grown on contamined soil. Environment cadmium contamination through phospate fertilisers represents an increasing problem (Schroeder et al., 1963).

Lead has the most significant toxic effect from the heavy metals. Sources of lead exposure are represented by leaded gasoline, battery manufacturing, leaded paints, pesticides,

cans, vegetal products grown on lead-contamined soil. Industrial decisions, such as the addition of lead to gasoline or to paints have created an epidemic of lead poisonings. Lead is a naturally occurring substance and can be found in organic and inorganic forms (Ebadi et al., 2005).

Lead poisoning leads to encephalopathies in the central nervous system, disturbances in kidney and liver functions progressing as far as necrosis, damage to the reproductive organs, anaemia and many metabolic deficiency symptoms. High lead levels in children's blood were shown to have an inhibiting effect on certain enzymes (Scheffer et al., 1989). Chronic intoxications can arise through the regular consumption of foodstuffs that are only slightly contaminated with lead.

Since accession of Romania to European Union, vegetal products produced in our country and intended for fresh market supply or for export have to meet the EU quality requirements and food safety legislation. Official quality control system of vegetables and fruits is based on the principle of product quality assurance at all stages of production – from producer to consumer.

The aim of this study is to determine the lead and cadmium concentration from 11 varieties of plums and 4 varieties of strawberries and to establish if these fruits are suitable for consumption. Also, the levels of lead and cadmium will be correlated with those set by Commission Regulation 466/2001 and Romanian legislation.

Strawberry and plums are fruits frequently consumed due to their great taste value, the content of easily available sugars, mineral salts and vitamins. The presence of heavy metals can produce serious damages to human health.

MATERIAL AND METHODS

It was analysed 11 varieties of plums and 4 varieties of strawberries provided by SCDP Valcea. The strawberries were harvested on 1.06.2007 and the varieties are Magic, Premial, Calina and Prundeni. The plums were harvested on 26.07.2007 and the varieties are: Centenar, Pescarus, Tuleu gras, Andreea, Tuleu timpuriu, Renclod Althan, Diana, Alina, Minerva, Alutus and Silvia.

For metal analysis, all the fruit samples were washed with distilled water in order to eliminate the air borned pollutants. The samples were sliced and dried on a sheet of paper in order to eliminate the excess of moisture. After these procedures, samples were precisely weighted. The plums were calcinated according with SR EN 14082:2003 and the strawberries were digested using microwaves according with SR EN 14084:2003.

Heavy metals concentrations were determined by electrothermal atomic absorption spectrometry (ETAAS). Each sample was analyzed in duplicate and the presented values (table 1) represent the average of determinations.

In order to effect the measurements it was used an atomic absorption spectrometer Zeenit 700 from Analytic Jena equipped with autosampler AS52 S for dilution.

Data were analyzed and processed with soft Win AAS ver. 3.16.0.

The calibration curves applied are linear for the studied ranges (figures 1, 2).

The used ultra pure water for samples' analytic preparation was obtained with a Simplicity system from Millipore.

RESULTS AND DISCUSSION

Commission Regulation 466/2001 sets a lead limit of 0,1 mg/kg in fruits, 0,2 mg/kg in berries and small fruits, and a cadmium limit of 0,050 mg/kg in all fruits. The same values were adopted by Romanian legislation, as well (Order no. 1201/2003/106/2004).

At plums, the lead content ranges between 0,02 – 0,047 mg/kg with mean value 0,033 mg/kg, meanwhile de cadmium content is between 0,007 – 0,023 mg/kg with mean value 0,016 mg/kg.

At strawberries, the lead content ranges between 0,006 and 0,038 mg/kg with mean value 0,021 mg/kg and the cadmium level is between 0,016 and 0,139 mg/kg with mean value 0,057 mg/kg. At strawberries there is one sample that exceeds the safe value of concentration for consumption. The obtained value is 2,78 times higher that the limit set by Commission Regulation 466/2001 and Romanian legislation.

The lead content for plums and strawberries is under the limit set by Commission Regulation 466/2001 and it can be concluded that these fruits are safe for consumption (table 2).

Similar studies were developed in other countries using the same fruits as we did and the results are analogous with our results (Thomas et al., 2006, Bednarek et al., 2006).

CONCLUSIONS

This study was undertaken to check whether the level of heavy metals in fruits could be in concentrations that are harmful to humans. The developed researches led to the conclusion that, with a single exception, the analyzed fruits are safe for human health from this point of view.

The average level of lead in plums and strawberries is low. Cadmium contents in plums and strawberries range between safe limits with the exception of a single strawberry sample where cadmium level is 2,78 times higher that safe limit.

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Tables

Table 1. Experimental results regarding lead and cadmium contents in fruits

Variety	Lead concentration (mg/kg fresh weight)	Cadmium concentration (mg/kg fresh weight)
Pescarus	0,040	0,023
Tuleu gras	0,047	0,018
Andreea	0,044	0,015
Centenar	0,036	0,023
Tuleu timpuriu	0,038	0,013
Renclod Althan	0,027	0,023
Diana	0,024	0,020
Alina	0,020	0,007
Minerva	0,040	0,015
Alutus	0,032	0,013
Silvia	0,023	0,015
Premial	0,025	0,139
Prundeni	0,038	0,035
Calina	0,015	0,040
Magic	0,006	0,016

Table 2. Quantification of lead and cadmium levels

Heavy metal / Fruit	Lead content (mg/kg) (safe limit under 0,1 mg/kg)		Cadmium content (mg/kg) (safe limit under 0,05 mg/kg)		
	< 0,025	**0,025-0,05**	**< 0,025**	**0,025-0,05**	**> 0,05**
Plum	3 samples (27,27%)	8 samples (72,72%)	3 samples (27,27%)	8 samples (72,72%)	0 samples
Strawberry	2 samples (50%)	2 samples (50%)	2 samples (50%)	1 sample (25%)	1 sample (50%)

Figures

Calibration function 1 9/10/2007 19:06 Calibration (Peak area)

Abs=k1+k2*conc

k1=0.005160 k2=0.042961 Recal. factor: ---

Slope	0.04296 Abs/(µg/L)	R2-adjusted	0.9980
sc0	0.01696 µg/L	Charact. conc.	0.10149 (µg/L)/1%A
Lower limit	0 µg/L	Upper limit	1.10 µg/L
Detec. limit (cal)	0.0445 µg/L	Deter. limit (cal)	0.1627 µg/L

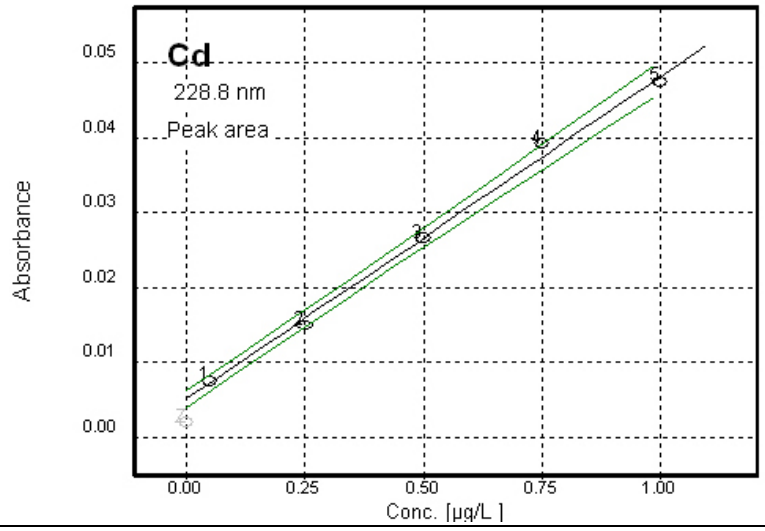

Fig. 1. Calibration curve for cadmium

Calibration function 1 6/05/2007 11:28 Calibration (Peak area)

Abs=k1+k2*conc

k1=0.000861 k2=0.004647 Recal. factor: ---

Slope	0.00465 Abs/(µg/L)	R2-adjusted	0.9989
sc0	0.08688 µg/L	Charact. conc.	0.93825 (µg/L)/1%A
Lower limit	0 µg/L	Upper limit	8.80 µg/L
Detec. limit (cal)	---	Deter. limit (cal)	---

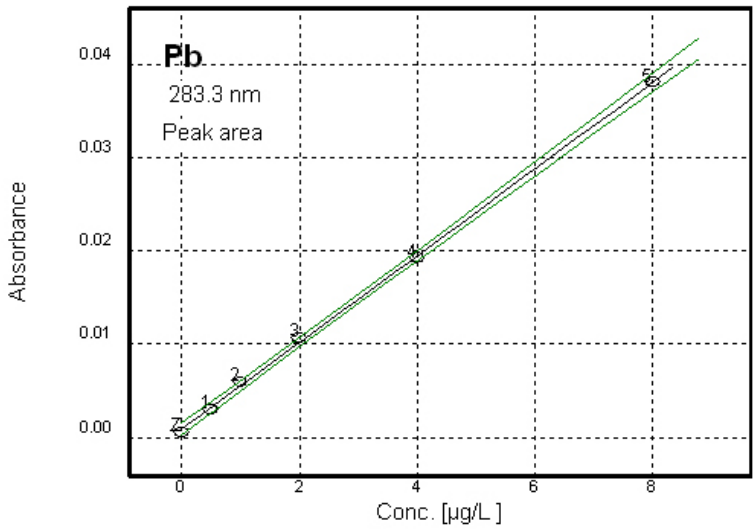

Fig. 2. Calibration curve for lead

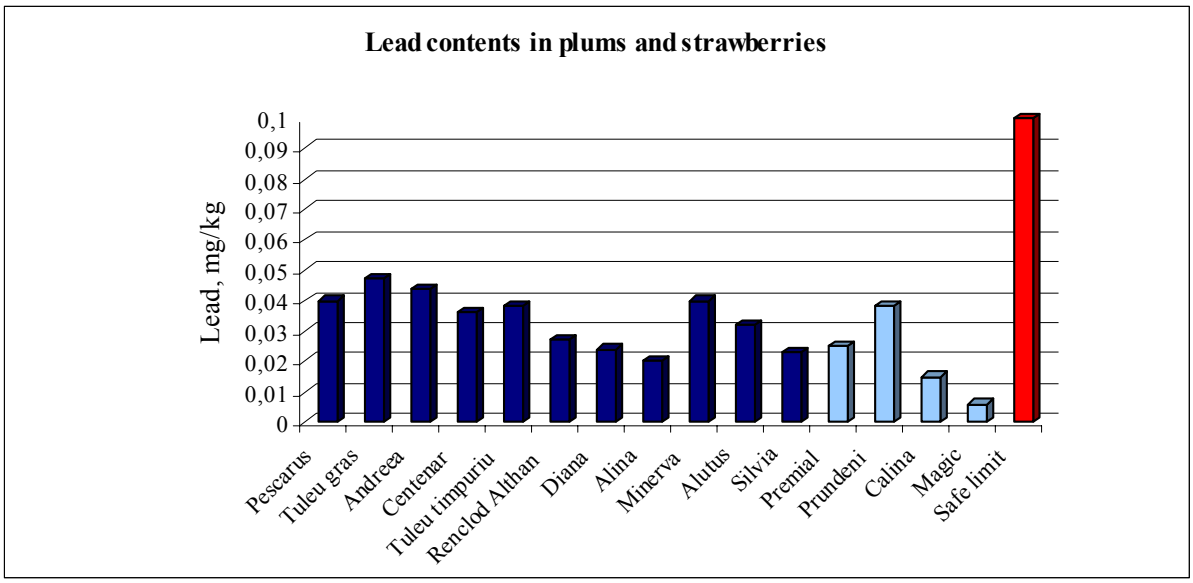

Fig. 3. Comparison between lead contents in fruits and safe limit

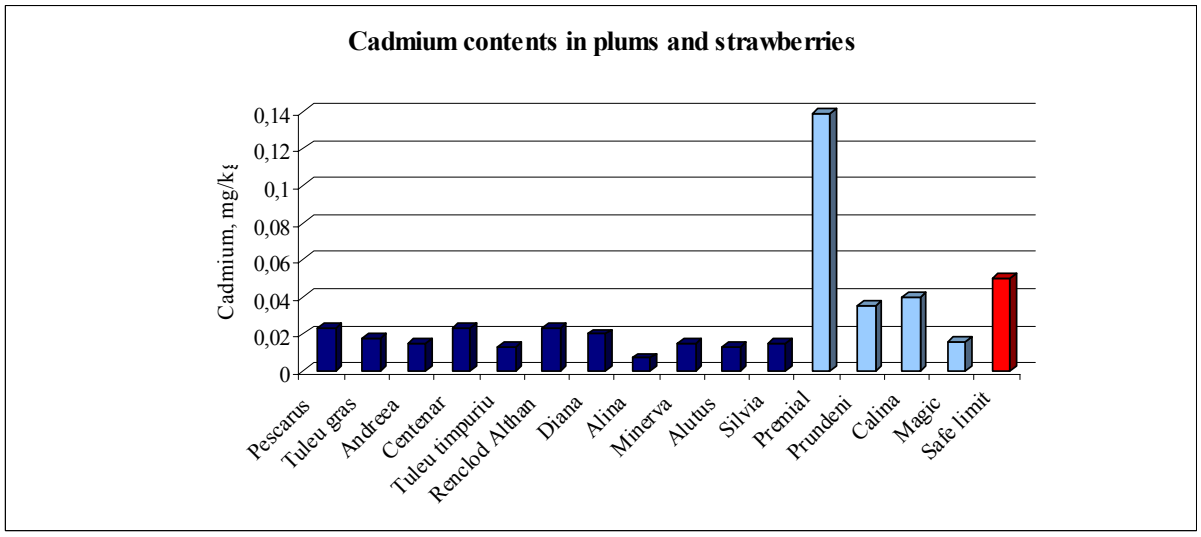

Fig 4. Comparison between cadmium contents in fruits and safe limit

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RESEARCHES REGARDING THE POSSIBILITIES OF FRUIT WORMS (*CARPOCAPSA POMONELLA L.*) CONTROL USING PHEROMONE ATTRACTORS AND NEW INSECTICIDES

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Keywords: codling moth, pheromone, biological products, chemical insecticides.

ABSTRACT

Codling moth (*Cydia pomonella L.*) remains to be a very important pest in most apple orchards.
This paper presents the results performed between 2005-2007 with home new insecticides for pest control in field plots.
The results were interpreted comparatively for biological products, chemical insecticides and untreated check.
The main results obtained were the following:
-with two treatments/eacle generation, Carpovirusine conc 0,1% had the maximal efficacy in controlling the all stages of *Cydia pomonella L*.
-the insecticide Calypso 480 SC conc. 0,02% was very effective in controlling the pest.
-the are remarked the importance of the pheromone traps in establishing the spreading are of the pests, the appreciation of the opportunity of treatments applying according to population level and establishing the optimal time for treatment warning.

INTRODUCTION

In the period 2005-2007, in the majority of the apple orchards of the tree-growing zone Voinesti, a strong attack of *Cydia pomonella* (the fruit worm) was registered.

The main reason was the lack of winter – time treatments and the accumulation of an important biological reserve.

So, in the period 2005-2007, at the untreated or inadequate treated trees (not respecting the warnings), the frequency of fruits with worms rose to values between 30- 50 %.

In the same period, the high pest density in the second part of the summer (gen. II and III) determined the accumulation of an important biological reserve.

So it became important to adopt an efficient strategy, which – together with the correct treatment warning - had to lead to a significant attack limitation, reducing the pollution causing insecticide consumption – and obtaining healthy crops.

The work presents the results obtained at S.C.D.P. Voinesti in the conditions of the years 2005-2007, using the pheromone ATRAPOM as a means to monitor and to warn of the apple worm, the microbiological products and the "Chemical Standard" variant.

MATERIALS AND METHODS

The researches have been organized on an experimental lot in the framework of the Farm nr. 1 at the S.C.D.P. Voinesti, on the Ionathan breed, on M_{106} graft bearers.

- The tree age = 12 years.
- The crown form: palmate with slanting arms; herbicide treated soil on the rows and with grass between the rows.

- The lot was organized with 5 variants in the years 2005 and 2006 – and with 3 variants in the year 2007. The variant with 5 trees (a tree = one repetition), was the following:

V_1 – NEEMAZOL conc. 0.5 %

V_2 – CARPOVIRUSINE conc. 0.1 %

V_3 – BIO 4510 Sarja conc. 0.15 %

V_4 – KARATE ZEON conc. 0.015 %

V_5 – MT. NTR.

V_6 – TREBON 30 EC conc. 0.03 %

V_7 – CALYPSO 480 SC conc. 0.02 %

V_8 – MT. NTR.

The result evaluation was realized at the beginning of September, before harvesting the fruits.

100 fruits/variants were analyzed for the generation I, respectively 150 fruits for each of the generations II and III.

The fruits attacked and dropped in the grass were evaluated at each analyzed tree.

The results of the treated variants were interpreted as compared with the untreated variant (untreated witness), situated in a nearby lot.

The efficiency of the treated variants was expressed as the frequency of the attack – free fruits in the total of the observed fruits.

The pest biology was sued with the help of pheromone traps (ATRAPOM), with 2 weekly readings, with the pheromone exchange at 45 days and a norm of 3 traps / hectare.

The number of the captured butterflies was compared with the specific PED value (2,5-3,0 butterflies/trap/week).

The use of pheromones permitted to register the principal parameters of the yearly biological pest cycle: the apparition and the duration of each generation, the first flying maximum and the egg laying start, the numerical population density and the evaluation of the attack risk, the necessity and the optimal moments for applying the chemical treatments.

RESULTS AND DISCUSSIONS

1. Control with new microbiological products:

V_1 – NEEMAZOL conc. 0.5 %

V_2 – CARPOVIRUSINE conc. 0.1 %

V_3 – BIO 4510 Sarja conc. 0.15 %

The treatment was applied at warning, with the spray pump STHIL 400.

The amount of solution per hectare was 1500 l (5 liters/tree).

The number of trees per variant: 5 (a tree = one repetition).

The microbiological products were applied mixed up with fungicide products, recommended for the control of the main leaf diseases (scurf and mildew).

At the end of the first pest generation, at the variants treated with biological products the attack frequency was 1,5 – 5,0 %, as compared with16,5 % (in the year 2007), respectively 31,5 % attacked fruits (in the year 2005) at the " untreated witness " variant.

Before harvesting the fruits, the products' biological efficiency was evaluated, registering values comprised between 1,0-3,6 % attacked fruits, respectively 90-95 % attack – free apples, as compared with 15,0 – 24,3 fruits with worms at the " untreated witness ".

2. Control with new insecticide products:

The products: KARATE ZEON conc. 0.015 %, TREBON 30 EC conc. 0.03 %, and CALYPSO 480 SC conc. 0.02 % were experimented.

At the end of June, after the first generation of the apple worm, the frequency of attacked fruits with was comprised, in this variant, between 1,0 % and 4,0 %, were as at the " untreated witness" 16,5 – 31,5 % apples with attack were registered.

At the final observation, before harvesting (in the second decade of September), at the chemically treated variants between 1,3 – 6,3 % attacked fruits were noted, as compared with 15,0 -24,3 strongly attacked fruits (1-3 galleries/fruit).

CONCLUSIONS

For the apple plantations of the tree-growing zone Voinesti – Valea Dambovitei, the fruit worm (*Carpocapsa pomonella L.)* represents one of the pest species with major incidence on the quality of the fruits and on their commercial value.

Among the new microbiological products, studied at S.C.D.P. Voinesti in the period 2005-2007, with the best biological efficiency in limiting the attack, CARPOVIRUSINE conc. 0,1 % (98,7 – 99,0 % attack – free fruits) was remarked.

At the chemically treated variants, the product CALYPSO 480 SC conc. 0,02 % proved the best control action, realizing to 98,7 healthy fruits.

The use of specific pheromone attractors permits the correct monitoring of the pest population and the establishing of the optimal warning and treatment application periods.

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Tables

Table 1. The biological efficiency of some new insecticides in the control of the *Cydia pomonella l species*

VARIANT (PRODUCT)	Conc. %	Year	Generation I			Generations II and III		
			EFFICIENCY %					
			Total fruits trees obs.+ drop	Of which attacked		Total fruits trees obs.+ drop	Of which attacked	
				Nr.	%		Nr.	%
NEEMAZOL (Biological product)	0,5	2005	200	10	5,0	300	11	3,6
		2006	200	7	3,5	300	5	1,6
CARPOVIRUSINE (Biological product)	0,1	2005	200	5	2,5	300	4	1,3
		2006	200	4	2,0	300	3	1,0
BIO 4510 Sarja (Biological product)	0,15	2005	200	6	3,0	300	10	3,3
		2006	200	3	1,5	300	8	2,6
TREBON 30 EC	0,03	2007	200	2	1,0	300	4	1,3
KARATE ZEON (STD)	0,015	2005	200	8	4,0	300	19	6,3
		2006	200	7	3,5	300	17	5,6
CALYPSO 480 SC (STD)	0,02	2007	200	2	1,0	300	4	1,3
MT. NTR.	-	2005	200	63	31,5	300	73	24,3
		2006	200	55	27,5	300	59	19,6
		2007	200	33	16,5	300	45	15,0

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PRELIMINARY RESULTS REGARDING THE TRANSFERENCE OF RED FRUIT SKIN AND FLESH TRAIT IN PEAR BREED PROGENY

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Keywords: *Pyrus communis*, breeding, selections, red fruit

ABSTRACT

In order to obtain new varieties with red flesh and skin colour, autochtonous "Cu miezul rosu" cv., having carmine-red coloured flesh, was used as male genitor in the controlled crosses with 'Napoca' cv. in the pear breeding program, started in 1986. As a result, was obtained a large progeny where red colour was transferred, from which three valuable 3 genotypes were selected. Data regarding ripening time, the major fruit characteristics and the flesh and skin anthocyanins content were presented.

INTRODUCTION

In literature, it has been frequently associated the skin colour with the amount of anthocyans and other antioxidants in fruit. According to Sanchez et al. (2003) the phenols content in the pear epicarp has ranged from 1235 to 2005 mg/kg and the ascorbic acid is 116-228 mg/kg. Regarding the antioxidant feature of mesocarp, there were recorded values of 28-81 mg/kg for phenols and 28-53 mg/kg for ascorbic acid. The pear antioxidant characteristic was mainly correlated to the chlorogenic acid content (Burzo et al. 2005). Having that in view and also the genetic biodiversity of Romanian pear collections corroborated to the market demand for various pear varieties, a breeding pear program has been initiated since 1984 (Braniste, 1997). Identification of some local varieties with red skin and flesh was easily done because such genotypes were common in various zones favourable to pear growing (Northern and Center of Transilvania, Moldova and Southern pre-Carpathians). Therefore, old autochtonous varieties, such as: Cu miezul roşu sin. Sangerii and Cordon were collected, the former being used as seedling rootstock for grafting the valuable pear cultivars (Parnia et al., 1984).

The paper describes the first results following the crossing between a white flesh cv. (Napoca) and a red flesh male genitor (Cu miezul rosu) as well as some offspring with fruit red skin and flesh.

MATERIALS AND METHODS

The pear cv., "Cu miezul rosu" (Fig. 1), used as male genitor is a vigorous, rustic tree, very resistant to drought and cold. It comes into bear in the 4th year after planting and bears on spurs, like pear clusters (5-10 pears per each). The fruit is small, 25-50 g weight, spherical – conic shape, long peduncle, greenish – yellow colour covered by purplish – blue shades on the sunny side. The flesh is carmine – red coloured, juicy, with sour-sweet and nice taste. Around the seeds place there is a larger of big and distant sclereids. The ripening and marketing season is late July and the shelf – life will last 2-3 days, then the fruit will break down. The dry matter content reaches 8.5-9%.

The controlled crossing performed in 1984 aimed at combining the characteristics of Napoca cv. (♀) (Dr. J. Guyot x pollen mixture), (Fig. 3) with pyriform fruit of greenish – yellow colour, 135 – 140 g weight, white, fondant, firm flesh which does not break down at

the time of marketing (3^{or} decade of August) and those of "Cu miezul rosu" cv. (♂), described above.

There were pollinated 390 flowers obtaining 92 fruit (23.5% fruit set) of which 377 mature hybrid seeds were collected. After bedding and sowing in the field 60 hybrid plants were recorded and transferred in the hybrids field (1986).

There were particularly studied the offspring having red skin fruit and red flesh (homosygotis for red flesh). The grafted selections 18-91-86 P, 18-96-86 and 18-105-86 P (Napoca x Cu miezul rosu cross), (Fig. 2) were planted in a field trial (1994). Anthocyanins content in fruit skin and flesh was determinate.

RESULTS AND DISCUSSIONS

The observations and readings in the field trial were done for the 3 pear selections of the above mentioned cross.

The major organoleptic fruit characteristics such as shape, colour, weight, calibration, texture, taste, percent of soluble solids (SS), data of anthocyanins content, comparatively to the female and male genitors are revealed in tables 1a and 1b.

Regarding the shelf life of fruit, 18 – 105 and 18 – 91 selections had a shorter life while 18 – 91 selection did not show a flesh breakdown.

Data of the anthocyanins content (AC) in fruit epidermis shows significant differences between Cu miezul rosu cv. (1.89 mg/100g) and H 18-96-86 P sel. (1.62mg/100g) in comparison with 18-91-86 P sel. (0.83mg/100g) and white fruit Napoca cv. (0.95 mg/100g). In fruit flesh, AC varied between 0.2mg/100g in Cu miezul rosu cv. and only 0.05mg/100g in Napoca cv.

Red flesh colour is present at the 0.13-0.2 mg/100g AC level.

Total AC in fruit (epidermis+flesh) ranged from 1mg/100g in Napoca cv. and 2.09 mg/100g in Cu miezul rosu cv.

CONCLUSIONS

As result, Cu miezul rosu cv. can be used as maternal genitor in controlled crosses for red fruit skin and flesh transference to the progeny.

The inheritance of red skin colour linked to red fruit flesh happens at the same time with changing their fruit shape and size as intermediate types.

The improvement of dry matter content and the expansion of ripening season is owed to the male genitor while the shelf life is much more influenced by the male genitor (liable to a rapid flesh breakdown).

In the following stage it is demanded to cross the intermediate selections resulted of recurrent genitors for improving the fruit quality, firmness, shelf life as well as for expanding the ripening season. It will also be analyzed the relationship between the anthocyans and other antioxidant components in red flesh pears.

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Table 1a. Comparative evaluation of some fruit characteristics

Selection/ cultivar	Harvesting data	Shape	Weight (g)	Calibre (mm)	Taste
18-91-86 P	26.VIII	Spherical	10–101	45–60	Good
18-96-86 P	26.VIII	Spherical-pyriform	60–78	50–55	Good
18-105-86 P	29.VIII	Pyriform	74–121	50–60	Good
Cu miezul rosu (♂)	30.VII	Spherical	30–50	65-70	Medium
Napoca (♀)	25.VIII	Pyriform	120-140	60-65	Very good

Table 1b. Comparative evaluation of some fruit characteristics

Selection/ cultivar	SS %	Skin colour	Texture and flesh color	Antocyanins mg/100 g
18-91-86 P	15.6	Dark red 60%	Medium, reddish-white	Skin 0.83 Flesh 0.11
18-96-86 P	17.2	Dark red 50%	Fine, reddish	Skin 1.62 Flesh 0.13
18-105-86 P	18.8	Red 100%	Fine, reddish	Skin 0.92 Flesh 0.16
Cu miezul rosu (♂)	8.5	Dark red 80%	Medium, reddish	Skin 1.89 Flesh 0.20
Napoca (♀)	15.2	Yellow	Fine, white	Skin 0.95 Flesh 0.05

Fig. 1. Cu miezul roşu cv.

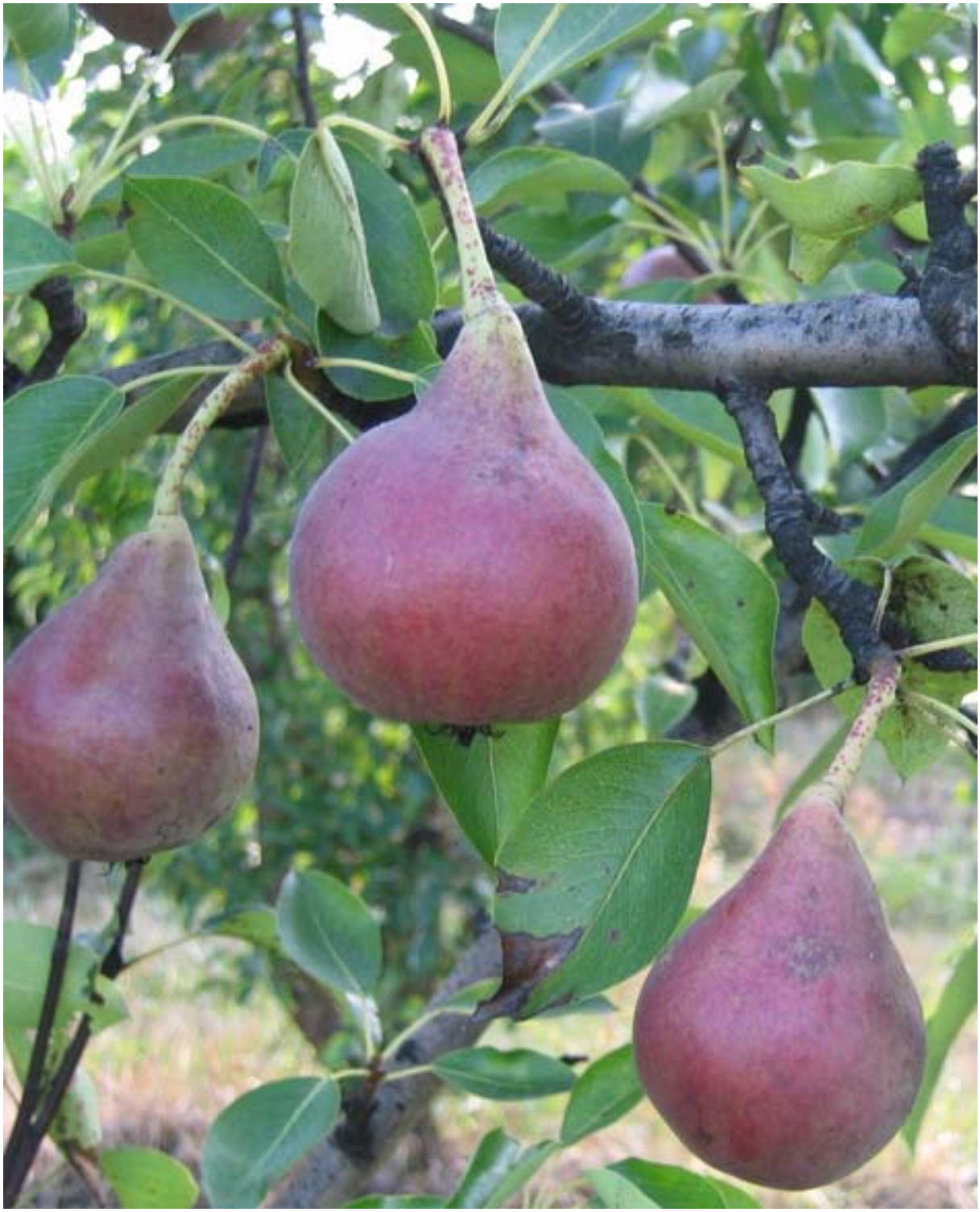

Fig. 2. 18-105-86 P sel.

Fig. 3. Napoca cv.

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UTILIZATION OF THE LOCAL GENETIC RESOURCES IN BREEDING NEW VALUABLE CULTIVARS FOR *MALUS* AND *PYRUS* SPECIES

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Keywords: apple, pear, local genetic resources.

ABSTRACT

„Ex situ" apple and pear collections from Romania are in Voinesti and Pitesti and preserve 262 autochtonous old apple cvs. and 162 local pear cvs. This paper describes their utilization as genitors in the genetic breeding work to induce attributes like disease resistance, rusticity, late ripening season and a good shelf life. Therefore, the old apple cvs. were employed: Verzisoare (late blooming), Cretesc, Calugaresc, Mar de Sugug (rusticity), Pionier, Voinea, Generos (Vf and poligenic resistance). For pear, the following cvs.: Busuioace (late blooming), Daciana, -Argessis, Carpica (earliness, flesh firmmess), Untoasa de Geoagiu (quality, spur fruiting), Cu miezul roşu (red flesh), Republica, Euras, Pere de mai (long shelf life under natural conditions) were used.

INTRODUCTION

The biodiversity is an inexhaustable spring for the characteristics and useful traits to achieve the specific and general objectives of the breeding programs focused on the improvement of cultivars.

The genetic resources from Romanian „ex situ" and „in situ" collections for Malus and Pyrus include 262 autochtonous old genotypes, 162 pear local varieties, respectively (Braniste N., Butac M., 2006). For many years, since 1949, when the first cross pollinations with apple were done within a breding program at Voinesti Station, Dambovita, several local varieties (with traits like: rusticity, late blooming, good storage) adapted to the pedoclimatic conditions of the area have been employed. Identically with pear since 1951 at Voinesti Station and since 1969 at Pitesti, many local and breeded varieties to improve the fruit quality (skin and flesh colour, size, resistance to major pests and diseaseas) were used. The single or reciprocal hybrid combinations such as local cv. X foreign cv., F1 selections x local cv., F1 selections x foreign cv., then F1, F2, F3 cv. X foreign cv. improved their genetic potential which led to introducing of some breeded and competitive genotypes in the wide range of varieties.

MATERIALS AND METHODS

During 1966-2007, for the commercial orchards, 48 cultivars were breeded having in their genealogy 14 local cvs., their hybrid selections used being in backcrosses. Until now, 25 pear genotypes having as genitors 11 local or breeded cultivars were registered as new varieties.

This paper deals with the utilization of the local genetic resources for apple and pear in two Romanian research centers between 1949 - 2007.

RESULTS AND DISCUSSIONS

At the Fruit Research Station Voinesti (1949-2007) there were several stages in breeding, using both local old varieties and also breeded cultivars from the previous generations. There were performed in all, over 800 hybrid combinations, utilizing 25 Romanian old and new cvs.,as well as 58 foreign cvs. as male and female parents.

In the first stage (1949-1957), one can see a great deal of hybrid combinations owing to an enthusiastic beginning in breeding but at the same time the same crosses were done one year after another due to less diverse genetic resources. Among the local varieties, the following: Cretesc auriu, Domnesc, Patul, Calugaresc, Cretesc de Valcea, Salciu, Cretesc salbatic, Cretesc rosu, Verzisoare, characteriped by rusticity and a remarkable adaptation were employed.

For improving the fruit quality as look, size and texture, a wide range of foreign cvs. presently in collections or orchards was used in hybridizations: Jonathan, Golden Delicious, Red Delicious, Kalter Bohmer, Gravenstein, Cox Orange, London Pepping, Wagner, Wealthy, Parmain d'or, Winter Banana, Reinette Bauman (table 1).

In the next stage (1965-1980), the first breeeded cvs. of F1 anf F2 crosses were obtained: Frumos de Voinesti (Jonathan x Belle de Boscoop), Delicios de Voinesti (Golden Delicious x Cretesc), Rosu de Cluj (Jonathan x Senator) as well as the selections: F2V4/103, V. 60-18-243 which were crossed with new introduced cvs.: Wellington, Ontario, Rome Beauty, Stark Beauty, Stark Delicious, NJ 40, Vista Bella, NJ 46, Prima (Vf). The genetic progress was highlighted with the newly breeded varieties with scab genetic resistance (Vf): Pionier (Jonathan x Verzisoare) x Prima; Generos (Parmain d'or x M. Kaido) x (Frumos de Voinesti x V. 60-6-51) Ciprian (Prima x Starkrimson), Voinea (Frumos de Voinesti x Prima), Poiana (Frumos de Voinesti x (Parmian d'or x M. Kaido) x Jonathan) and the selections in F2, F3 with M. zumi, M. Kaido, M. micromalus. These were reciprocally crossed (1981-2002) with other foreign genotypes to get resistance to other diseases and to improve the fruit taste. So, in the breeding work, some other varieties: Florina (Vf), Liberty (Vf), Priam (Vf), Sir Prize (Vf), Mc Free (Vf), Nova Easygro (Vr), NJ 55, Coop 8, Fuji, Cortland, Granny Smith, Empire were involved.

Presently, there is a new stage, since 2002 a new breeding program has beeen initiated using as male and female genitors in the cross pollinations, the autochtonous breeded cvs.: Luca, Ciprian, Generos, Rebra, Iris, Irisem, Redix, Real with the foreign breeded generation: Goldrush, Golden Lasa, Sonya, Falstaff, Royal Gala cvs., in order to improve the disease resistance (Vf x polygenic) as well as the market look, flesh texture and fruit shelf life.

There are other apple breeding programs in Cluj, Bistrita and Pitesti research centers where the local or autochtonous breeded varieties were used as parents.

The pear breeding program was started in 1951 at Voinesti. Unlike the apple, in the first stage the number of cultivars employed as genitors was small, 3 – 4 local cvs.: Busuioace, Dulci de vară, Pietrose, Rosior pietros and 5 – 6 foreign cvs.: Williams, Clapp's Favourite, M. Marrilat, B. Clairgeau, D. d'hiver, M. Levavasseur. That is why, the number of hybrid combinations was limited, from 1 to 14 and the same crosses were yearly repeated until 1970. The breeding objective was focused on the fruit size and quality (texture and taste).

After 1981, better genotypes were introduced as genitors: Timpurii de Dambovita (Busuioace x Clapp's Favourite), Republica (D. d'hiver x M. Lavavasseur), Euras (P. serotina x Olivier de Serres) x D. d'hiver, Argessis (Napoxa x B.p. Morettini), Napoca (Dr. J. Guyot x pollen mixture), Monica (Santa Maria x Principe de Gonzaga).

Table 2 shows the cross pollinations with pear and local cultivars used in 87 combinations carried on for 23 years during 1951 – 2007.

Lately, the major objective has been the resistance or tolerance to fire blight (*E. amylowora*) and *Psylla* sp., of the winter cvs. stored in natural conditions or cold storages.

In Pitesti, the objective of the first breeding stage (1969 – 1979) was to obtain early varieties with big fruit and no internal breakdown. So, local varieties with early ripening season but with small fruit, scab susceptible were chosen (Codita, Orzatice, Santiliesti, Cu miezul rosu) and crrosed with B. Giffard, B.p. Morettini, Morettini 113, Williams and Santa Maria. There were obtained a few commercial cultivars with early ripening season (for 10 days in July and August): Trivale, Triumf, Daciana, Argessis, Getica and Carpica recommended to the farmers.

Since 1981 up to now, the breeding objectives were more complex directed to obtaining winter cultivars with good shelf life and taste similar to Williams cv. With this regard, local varieties like: Pere de mai, Pere de iarna, Jupanesti and the synthetic cv. Republica were used as parents, getting promising hybrids. Also, after 1991 as a result of the climatic changes and genotype vulnerability to fire blight and *Psylla* attack we had to work with tolerant cvs. or resistant species (P. serotina) to get more resistant hybrids (table 2). In the hybrid combinations, 13 local and breeded cvs. as well as 13 foreign cvs. were introduced as valuable genitors, with high quality fruit, simultaneously, some genetic breeding work was carried out in the Research Stations Bistrita and Cluj.

CONCLUSIONS

To conclude, the utilization of the local varieties in the Romanian breeding programs for a rather long period (1949 – 2007) was a continous concern due to a small number of varieties with poor quality fruit at the beginning and thereafter for improving the disease resistance and fruit quality characteristics to meet the internal and external marketdemands. In Voinesti and Pitesti, local genetic resources for apple and pear were involved: 25 old and breeded apple cvs., 30 pear cvs., getting over 800 apple hybrid combinations and 113 pear ones.

One can see that the genetic advances were achieved along the hybrid generations obtained, which gradually became valuable selections and varieties, some of them being also propagated to day.

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Table 1. Apple local and breed cultivars used in cross combinations between 1949-2007

Years	No. of cross combinations	Romanian local and breed cultivars used as genitors	Foreign cultivars used as genitors
1949-1957	448	Creţesc auriu, Domnesc, Pătul, Călugăresc, Creţesc mare de Vâlcea, Sălciu, Creţesc sălbatic, Creţesc roşu, Verzişoare, Roşior românesc, Botane, Creţesc de Breaza	Kalther Bohmer, Cocs Orange, London Pepping, Antonovka, Calcille rouge, Belle fleur jaune, Winter Banana, Red Delicious, Belle de Boscoop, Jonathan, Reinette Baumon, Wagner, Wealthy, Reinette Ananas, Boiken, Fey's Record, Mc Intosh, Gravenstein, Golden Delicious, Court Pendu plat, Parmain d'or, Red Delicious, Reinette de Canada, Maşanschi, R. Blenheim
1965-1980	108	(F1) Frumos de Voineşti, Roşu de Cluj, 53-25-29 V, 53-25-30 V, 3/47 V, 53-25-32 V, 53-12-2 V, Delicios de Voineşti, Verzişoare (F2) V 4/103 (Parmain d'or x M. kaido)x Jonathan (F2) V 60-18-243 (Jonathan x M. zumi) x Winter Banana (F1) V 70-59-4 (Frumos de Voineşti x Prima)	Jonathan, Wagenr, Wellington Ontario, Rome Beauty, Golden Delicious, Stark Delicious, Nj 40, Vista Bella, NJ 46, Prima (Vf)
1981-2002	221	Frumos de Voineşti, Delicios de Voineşti, sel. F3 cu Verzişoare, Pionier (Vf), Voinea (Vf), T120 (poligenic), Generos (poligenic), V 142/24 (Vf), V 2/2 (Vf), Ciprian (Vf) (F3) V 51/219, Creţesc (F3) Luca (31/1), V 9/231, V 52/144, sel F2, F3 cu M. zumi, M. kaido, M. micromalus	Prima (Vf), Priam (Vf), Antonovka, Belle de Boscoop, Empire, NJ 76, A 3272, Cortland, Mutsu, Florina (Vf), Liberty (Vf), Sir Prize (Vf), Mc Free, Nova Easygro, Fuji, Starkrimson, NJ 55, Coop 8, Granny Smith, Wijcik, Golden Delicious, Jonathan, Parmain d'or
2002-2007	37 (+ 15 iradiate)	Luca, Ciprian, Frumos de Voineşti, Generos, Rebra Iris, Irisem, Redix, Real, V 1/26, V 3/123	Florina (Vf), Liberty (Vf), Priscilla (Vf), Goldrush (Vf), Nova Easygro (Vf), Nicol (CoVf), DL 35 (Vf), Golden Lasa (Vf), Sonya, Falstaff, Royal Gala, Discovery (poligenic), Empire, Idared, Goldspur, Colmar (CoVf)
TOTAL	814 (+ 15)		

Table 2. Pear local and breed cultivars used in cross combinations between 1951-2007

Location	Years	No. of cross combinations	Romanian local and breed cultivars used as genitors	Foreign cultivars used as genitors
Voineşti	1951-1973	61	Bucuioace, Dulci de vară, Pietrose, Roşior, Pietros, Roşioare, Timpurii de Voineşti, Timpurii de Dâmbovița	Williams, Clapp's Favorite, B. Clairgeau, M. Marillot, M. Levavasseur, D. d'hiver, D. d'Angouleme, Josephine de Malines, Pres. Mas, B. Hardy, B. Giffard, B.p. Morettini
	1981-2007	26	Republica, Euras, Argessis, Haydeea, Napoca, Monica, Roşior pietros	Passe Crassane, Williams rouge, B. Hardy, B. Clairgeau, D. du Comice, Jeanne d'Arc, Forelle
TOTAL	X	87	17 cvs.	20 cvs.
Piteşti	1969-1979	13	Codița, Sântilieşti, Orzatice 1, Cu miezul roşu, Napoca, Republica, Iernatice, Aniversarea	Morettini 113, B.p.Morettini, B. Giffard, Williams, Santa Maria, Principe di Gonzaga
	1981-2007	13	Pere de mai, Republica, Pere de iarnă, Imperiale, Monica, Cu miez roşu, Napoca, Ervina	Gen Osmanwil, Bristol Cross, Delmoip, Highland, Gen. Leclerc, Packham's Triumph, Williams
TOTAL	X	26	13 cvs.	13 cvs.

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EVALUATION OF FOREIGN PLUM VARIETIES (*PRUNUS DOMESTICA* L.) FROM ROMANIAN NATIONAL COLLECTION

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Keywords: Plum, germplasm fund, foreign varieties, evaluation, potential genitors.

ABSTRACT

In Romania, the plum holds the first place in the national fruit patrimony as acreage, number of trees. One of the most important conditions for reaching the objectives in the breeding program is availability of the rich germplasm fund. The National Plum Collection (NPC) located at the Research Institute for Fruit Growing Pitesti – Maracineni (RIFG), holds 566 accessions from which 318 genotypes are of foreign origin. This germplasm fund has been evaluated regarding tolerance to PPV, susceptibility to *Monilia* sp., precocity, blooming period, fruit size, content in soluble solids, yielding capacity, tree vigour, according to the numerical scale of IBPGR descriptors used in Genres Project 61 of „*Prunus* Data Base". Study shows that the numerous genotypes existing in the NPC offer enough initial material to achieve the objectives of Romanian plum breeding program (e.g. Belle de Louvain, Burton, Chabat, Giant Plum, Kirke, LU - for tolerance to PPV; Cacak Ranna, Cacanska Rodna, De Maris, Giant Plum, LU – for large fruit).

INTRODUCTION

The establishment of some methodical organized plum collections started in 1967 at RIFG Pitesti – Maracineni and 1985 at Strejesti, Fruit Research Station.

Presently, there are plum collections in two centers, respectively at RIFG Pitesti– Maracineni and Valcea, Fruit Research Station, summing up 812 genotypes of which 43 species, 323 autochtonous cultivars, 564 foreign cvs. and promosing selections. (Cociu et. al., 1997, Braniste and Butac, 2006).

The NPC, located at the RIFG Pitesti – Maracineni, was established in 1997, including 566 accesions of which 318 are foreign genotypes.

The purpose of this study is the evaluation of the foreign plum cultivars from the germplasm fund in Pitesti – Maracineni, for selecting some potential genitors to be used in the breeding programs.

MATERIAL AND METHODS

The studies were performed on 160 foreign plum cvs. from the National Plum Collection at RIFG Pitesti – Maracineni.

The observations and measurements were done according to the descriptors for *Prunus* genus (Genres 61 Project of the Working Group „*Prunus* Data Base", IPGRI).

List of descriptors for *Prunus* genus

Fruit use: 1. No use; 2. Table; 3. Dual or multipurpose use.

Plant use : 1. Clonal rootstock; 2. Clonal interstock; 3. Seedling rootstock; 4. Ornamental / Pollinator; 5. Dual or multipurpose use; 6. Botanical (wild) species; 7. Other; 8. Timber; 9. No use.

Status of sample: 1. Wild; 2. Primitive cultivar / Landrace; 3. Breeded cvs.; 4. Clones; 5. Clonal rootstock.

Virus disease status: 1. No virus; 2. No symptoms; 3. With virus.

Season of flowering: 1. Extremely early; 2. Very early; 3. Early ; 5. Intermediate; 7. Late; 8. Very late; 9. Extremely late.

Harvest maturity: 1. Extremely early; 2. Very early; 3. Early ; 5. Mid-season; 7. Late; 8. Very late; 9. Extremely late.
Fruit size: 1. Very small (< 10 g); 3. Small (11-25 g); 5. Medium (26-40 g); 7. Large (41-55 g); 8. Very large (56-70 g); 9. Extremely large (>70 g)
Fruit shape: 1. Flat; 2. Round; 3. Elliptic; 4. Elongated-elliptic; 5. Ovate; 6. Heart shaped; 7. Drop shaped.
Skin colour: 1. Whitish; 2. Green; 3. Yellow / Green; 5. Orange; 7. Purple / Red; 8. Violet / Blue; 9. Dark blue.
Stone adherence to flesh: 1. Freestone; 2. Semi-freestone; 3. Clingstone.
Susceptibility to *Monilia* sp.: 1. Resistant; 2. Very low susceptible; 3. Low susceptible; 5. Intermediate; 7. Susceptible; 8. Very susceptible; 9. Extremely susceptible.
Susceptibility to PPV: 1. Resistant; 2. Very low susceptible; 3. Low susceptible; 5. Intermediate; 7. Susceptible; 8. Very susceptible; 9. Extremely susceptible.

RESULTS AND DISCUSSIONS

A comparative analysis over a 10 year period of the fruit characters and features from the foreign plum varieties in the NPC give opportunity to select a group of promising genotypes for the plum genetic breeding programs (Table 1).

Blooming time. Regarding the time of full bloom, the varieties made up 4 classes as follows: 3 very early blooming cultivars, 28 early blooming cultivars, 99 mid-season blooming and 30 late blooming. Usually, late blooming is considered a positive characteristics to better avoid late spring frosts. The following cvs. are recommended as potential genitors: Blue Bell, Bluefree, Giant Plum, Grand Prix, Korai Bestercei, Late d'Agen, Paczelt, etc.

Harvesting time. Varieties were classified into 6 classes, namely: 1 extremely early maturation cultivar, 3 very early maturation cultivars, 31 early maturation cultivars, 76 mid-season maturation cultivars, 47 late maturation cultivars and 3 very late maturation. Concerning the maturation are recommend as potential genitors for earliness, the following cvs: Anasovaska, Early Rivers, Ruth Gerstetter, Belsika Ranna, Black Prince, Cacak Ranna, etc. For lateness (ripening in September) are suggested cvs. like: Anna Spath, Blue Bell, Bluefree, Hackmann, Pozegaca, etc.

Fruit characteristics. *Average fruit weight* (AFW) was determined by weighing 25 fruit in each of 3 consecutive years. The cultivars were put into 6 classes: 39 cultivars with AFW 11 – 25 g; 68 cultivars with AFW of 26 – 40 g; 36 with AFW of 41 – 55 g; 15 cultivars with AFW of 56 – 70 g; and 2 cultivars with AFW over 70g. Most cultivars therefore have fruit over 40 g which can be used as potential genitors in the breeding work: Blue Bell, Bluefree, De Maris, Eldorado, Giant Plum, Grand Prix, Valor, etc.

The optimum *fruit shapes* (elliptic, elongated-elliptic and ovate) is found in 78 cultivars and 82 cultivars had round shape. Dark blue skin colour is found in 62 cultivars, violet – blue in 31, purple – red in 42, orange in 13, yellow – green in 10 and green in 2 genotypes. Regarding the fruit shape and skin colour, on the Romanian market are demanded elliptic and ovate shaped fruit (Belle de Louvain, Blue Bell, Bluefree, Oneida, etc), with blue and dark blue colour (Blue Bell, Bluefree, Brompton, Burton, Cardinal, Huttner, Kjustendilska, Montfort, Oneida, Paczelt, Pozegaca, Stanley, Valor, etc).

According to our observations, 89 varieties are completely *freestone* (Belle de Louvain, Blue Bell, Bluefree, Jefferson, OK, Pozegaca, President, Valor, etc.).

Disease susceptibility. The resistant to *Monilia* ssp., is found in 109 of 169 cultivars. Within the collection, susceptibility to Sharka (PPV) was scored as: no susceptible - 25 cultivars, very low susceptible – 5 cultivars, low susceptible – 63 cultivars, mid susceptible – 45 cultivars, susceptible – 21 cultivars, very susceptible – 1 cultivar. As a gene source for the

disease resistance, can be used: for *Monilia* –Belle de Louvain, Burton, Cardinal, Cochet Pere, Giant Plum, Hackmann, Huttner, LU, OK, etc; for Sharka –Belle de Louvain, Burton, Huttner, Kirke, LU, OK, etc.

CONCLUSIONS

To conclude, the variability within the National Plum Collection is ample for most traits. Consequently, the chances of selecting appropiate parents for achieving the breeding objectives are high.

The objectives of the Romanian plum breeding program are similar to other programs in Europe: tolerance to PPV, resistance to *Monilia* ssp., late blooming, large fruit, attractive colour, high content in soluble solids, etc.

Studies on material in the collection have emphasized some parents with comlementary traits which can be used in controlled hibridizations. Concern continues for increasing the germplasm fund, and discovering new and better genetic resources to be utilized in future breeding work.

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Table 1. Evaluation of foreign plum accessions in the national collection

No.	Genotype	Collection*	Origin	Status of sample	Virus disease status	Fruit use	Plant use	Harvest maturity	Season of flowering	Fruit size	Fruitshape	Skin colour	Stone adherence to flesh	Susceptibility to Monilia	Susceptibility to PPV
1	Abbaye d'Arton	P,VL	FRA	2	2	3	5	5	5	7	7	7	1	2	1
2	Abondance	P	FRA	2	2	3	5	5	5	7	2	7	1	1	1
3	Afizka	P,VL	BUL	2	2	3	5	5	3	5	2	3	1	2	1
4	Agen	P,VL	FRA	2	3	3	5	5	5	5	4	7	2	3	5
5	Agen 698	P,VL	FRA	4	3	3	5	5	5	3	4	7	2	3	7
6	Agen 707	VL	FRA	4	3	3	5	7	5	3	4	7	2	3	5
7	Allo	P	USA	3	2	2	5	5	2	8	2	7	1	1	2
8	Annasovaska	P	BUL	3	3	3	5	1	3	3	3	8	1	1	7
9	Anatolia	P,VL	BUL	3	3	3	5	5	5	5	2	7	2	1	5
10	Angliska svetska	VL	UCR	3	3	2	5	5	5	5	3	8	1	1	3
11	Anna Spath	P	GER	3	3	3	5	8	5	7	2	8	2	1	5
12	Belle de Liege	P,VL	FRA	3	3	2	5	5	5	5	3	7	3	2	3
13	Belle de Louvain	P	FRA	3	2	2	5	5	5	5	3	8	1	1	1
14	Belle de septembrie	P	FRA	2	3	2	5	7	5	5	3	8	1	1	3
15	Belsika ranna	P	BUL	3	3	2	5	3	5	5	2	8	2	1	5
16	Black Prince	P	JUG	3	3	2	5	3	3	5	2	8	1	1	5
17	Blaisdon Red	P	FRA	3	3	2	5	5	5	5	2	7	1	1	3
18	Blue Bell	P,VL	USA	3	3	2	5	8	7	8	4	9	1	5	5
19	Bluefree	P,VL	USA	3	3	2	5	8	7	8	4	9	1	3	5
20	Brompton	P,VL	USA	5	3	2	3	7	5	3	3	9	3	3	3
21	Burbank	P	USA	3	2	2	5	3	3	8	2	7	3	9	3
22	Burton	P	USA	3	2	2	5	7	5	5	3	9	1	1	1
23	Cacak Ranna	P	JUG	3	3	2	5	5	5	7	5	7	1	3	3
24	Cacanska Najbolia	P,VL	JUG	3	3	2	5	5	5	7	3	9	2	3	5
25	Cacanska Rodna	P,VL	JUG	3	3	2	5	3	5	7	5	9	1	1	5
26	Cacanska secer	P	JUG	3	3	2	5	7	5	7	5	7	1	1	3
27	California Blue	P	USA	3	3	2	5	3	5	5	2	9	1	2	5
28	Can	P	USA	3	2	2	5	5	3	5	2	3	1	1	1

29	Cardinal	P	ITA	3	3	2	5	5	5	7	2	9	1	1	7
30	Cervelata	P,VL	ITA	3	3	2	5	5	5	5	3	9	2	1	3
31	Cervena Edra Ranna	P	BUL	3	2	2	5	5	5	7	2	9	2	3	1
32	Chabat	P	USA	3	2	2	5	3	3	3	2	5	2	3	1
33	Chisinevscaia	P	UCR	3	3	3	5	5	5	7	3	7	2	3	3
34	Cimerova	P	BUL	3	3	3	5	3	5	5	3	9	1	1	5
35	Coates	P	FRA	3	3	3	5	7	5	3	3	3	2	1	3
36	Cochet Pere	P	FRA	3	3	3	5	5	3	7	3	7	1	1	2
37	Coe's Golden Dropper	P	ANG	3	3	2	5	5	5	9	2	3	1	3	5
38	Cox Emperor	P	ANG	3	3	2	5	7	5	5	2	8	2	1	3
39	Czar	P,VL	FRA	3	3	2	5	5	5	3	2	9	1	5	3
40	Damme Aubert Blanche	P	FRA	3	3	2	5	5	5	8	3	3	1	3	3
41	Damme Aubert Jaune	P	FRA	3	3	2	5	7	5	8	3	5	1	3	7
42	De Bordeaux	P, VL	FRA	2	3	3	5	5	5	5	5	8	1	1	7
43	De Maris	P	FRA	2	2	3	5	5	5	9	2	5	3	1	1
44	Delikia	P	BUL	3	3	3	5	5	5	5	2	7	2	1	7
45	Deniston`s super	P	FRA	3	3	2	5	5	5	5	2	5	1	1	7
46	Deniston's Gage	P	FRA	3	3	2	5	5	5	5	2	3	1	1	7
47	Dollan	P,VL	YUG	2	2	2	5	5	5	7	3	5	2	1	1
48	Drjanovska Sliva	P	BUL	2	3	3	5	5	5	5	3	9	2	1	7
49	Dry seedling	P	ANG	2	3	3	5	7	3	7	2	7	2	1	5
50	Durantine	P	FRA	3	2	3	5	7	5	5	2	9	3	1	1
51	Early Blue	P		3	3	2	5	3	5	5	2	9	1	1	1
52	Early Golden	P	ITA	3	3	2	5	3	3	5	2	5	1	5	3
53	Early Laxton	P	ANG	3	3	2	5	3	5	3	2	9	1	1	5
54	Early Orleans	P	ITA	3	3	2	5	3	3	5	2	7	1	1	3
55	Early Rivers	P	ANG	3	3	2	5	2	3	5	2	8	2	1	3
56	Eldorado	P,VL	JUG	3	3	2	5	3	3	7	2	8	2	3	3
57	Emma Lepermann	P,VL	JUG	3	3	2	5	3	3	7	2	8	2	3	8
58	Favorita Sultanului	P	ITA	3	3	2	5	5	5	7	5	8	2	1	3
59	Fertilia	P	ITA	3	3	2	5	5	5	5	2	9	2	1	5
60	Fertlity	P	USA	3	2	2	5	3	3	3	2	9	3	1	1
61	Forly II	P	ITA	4	3	2	5	7	5	5	2	9	1	1	3
62	Forly III	P	ITA	4	3	2	5	7	5	5	2	9	1	1	3

63	French Improved	P	FRA	3	3	3	5	5	5	5	3	7	2	3	3
64	French Prune	P	FRA	3	3	3	5	5	5	5	3	7	2	2	3
65	French X Petite	P	FRA	3	3	3	5	5	5	5	3	7	2	2	3
66	Fruhewetsche	P	GER	3	3	3	5	3	3	5	2	8	2	1	7
67	Giant plum	P	ITA	3	2	3	5	5	7	8	3	7	3	1	1
68	Grand Prix	P,VL	USA	3	3	2	5	5	7	7	3	8	1	2	3
69	Great Yelow	P	USA	3	3	2	5	3	3	8	2	5	2	7	3
70	Grossa Suzucheratta	P,VL	ITA	3	3	3	5	7	5	5	3	7	3	3	3
71	H 91/1	P	JUG	4	3	2	5	3	5	3	3	9	1	1	3
72	H 91/2 Iugoslavia	P	JUG	4	3	2	5	3	5	3	3	9	1	1	5
73	H II/II/80/59	P	JUG	4	3	2	5	3	3	5	5	9	1	2	3
74	II/II/80/59 Iugoslavia	P	JUG	4	3	2	5	3	3	5	5	9	1	2	3
75	Hackmann	P	USA	3	3	2	5	7	5	7	2	8	1	1	3
76	Hamanova Svetska	P	CEH	3	3	3	5	7	5	5	5	9	1	1	3
77	Huttner	P,VL	USA	3	2	2	5	7	5	3	2	9	3	1	1
78	Ialova	P,VL	FRA	3	3	3	5	3	5	5	2	7	3	3	5
79	Ierusalimi Kek	P	FRA	3	2	3	5	3	5	5	2	3	1	1	1
80	Jefferson	P,VL	USA	3	3	3	5	5	5	5	2	8	1	2	3
81	Jelica	P,VL	JUG	3	3	2	5	7	5	5	3	9	1	3	3
82	Jori’s Plum	P,VL	USA	3	3	2	5	7	5	5	5	9	3	5	5
83	Kazalinska	P	BUL	3	3	2	5	7	5	5	3	9	3	1	5
84	Kentish Bush	P	ANG	3	3	2	5	7	5	5	2	9	2	1	3
85	Kirke	P,VL	ANG	3	2	2	5	7	5	7	2	7	2	1	1
86	Kirke’s Blue	P	ANG	3	3	2	5	7	5	7	2	7	2	1	1
87	Kjustendilska	P,VL	BUL	3	3	2	5	7	5	3	5	9	1	3	3
88	Korai Bestercei	P	UNG	3	3	3	5	5	7	3	4	7	1	1	5
89	Kralita Ivazonka	P	BUL	3	3	3	5	5	5	3	5	8	2	1	7
90	Krimska	P	BUL	3	2	2	5	5	3	5	2	5	2	1	1
91	Late d'Agen	P	FRA	3	3	3	5	7	7	5	5	7	2	1	3
92	Laxton Beautiful	P	ANG	3	2	3	5	5	5	5	2	9	3	1	1
93	Laxton Cropper	P	ANG	3	3	3	5	5	5	5	2	8	1	1	3
94	Laxton Supreme	P	ANG	3	3	3	5	5	5	5	2	9	3	1	7
95	LU	P	USA	3	2	3	5	5	3	7	2	7	1	1	1
96	Lutzelsachsen	P	GER	3	3	3	5	2	2	3	5	8	3	1	5

97	Marry Mather	P	USA	3	3	2	5	5	5	5	2	8	1	1	3
98	Methley	P	USA	3	3	2	5	3	3	5	2	8	3	3	3
99	Mirabelle de Metz	P	FRA	2	3	3	5	7	5	3	2	5	2	2	3
100	Mirabelle de Nancy	P,VL	FRA	2	3	3	5	5	5	3	2	5	2	2	3
101	Mirabelle Herenhausen	P	FRA	2	3	3	5	5	5	3	2	7	2	1	3
102	Mohawk	P	FRA	3	3	2	5	5	7	8	2	2	3	1	3
103	Montfort	P	ITA	3	3	3	5	5	5	5	2	9	1	1	5
104	Montgomery	P	USA	3	3	2	5	3	3	8	2	7	2	7	3
105	Nikitskaia Rannaia	P	UCR	3	3	3	5	5	5	5	3	8	2	1	7
106	O.K.	P	ITA	3	2	2	5	3	5	5	5	8	1	1	1
107	Olasz kek	P	JUG	3	2	3	5	5	5	7	2	5	2	3	1
108	Oneida	P,VL	USA	3	3	2	5	5	5	7	3	9	2	3	3
109	Ontario	P	USA	3	3	2	5	5	5	5	2	3	1	1	2
110	Opal	P,VL	ITA	3	2	2	5	5	5	5	2	7	1	3	1
111	Osort 300	P	JUG	4	3	2	5	7	5	7	3	9	1	2	7
112	Paczelt	P	JUG	3	3	3	5	7	7	3	3	9	1	1	5
113	Peny Gley	P	FRA	2	2	3	5	5	5	3	2	9	3	1	2
114	Pond's seedling	P	ANG	2	3	3	5	5	5	3	2	7	2	1	5
115	Pozegaca	P	JUG	2	3	3	5	7	7	3	4	9	1	1	5
116	Pozegaca 1/81	P	JUG	4	3	3	5	7	7	3	4	9	1	1	5
117	Pozegaca 11/81	P	JUG	4	3	3	5	7	7	3	4	9	1	1	5
118	Pozegaca 4/81	P	JUG	4	3	3	5	7	7	3	4	9	1	1	5
119	Pozegaca 6/81	P	JUG	4	3	3	5	7	5	3	4	9	1	1	5
120	Pozegaca 7/81	P	JUG	4	3	3	5	7	7	3	4	9	1	1	5
121	Pozegaca B1	P	JUG	4	3	3	5	7	7	3	4	9	1	1	3
122	Pozegaca OS1	P	JUG	4	3	3	5	7	7	3	4	9	1	1	3
123	President	P	USA	3	3	2	5	7	5	7	2	9	2	1	5
124	Queenstal	P	ANG	3	3	2	5	3	3	5	2	7	1	1	5
125	Quetsche Blanche Letricot	P	GER	4	3	3	5	7	7	3	5	3	1	3	3
126	Quetsche d'Allemagne	P	GER	3	3	3	5	7	5	7	5	9	3	1	5
127	R.C. Althan	P	FRA	2	3	2	5	3	5	7	2	7	1	1	3
128	R.C Diaphane	P	FRA	3	3	2	5	3	5	7	2	7	1	1	3
129	R.C Eccully	P	FRA	3	3	2	5	7	5	8	2	9	3	1	3
130	R.C Oulins	P,VL	FRA	3	3	2	5	5	7	5	2	9	1	1	5

131	R.C Verde 7/33	P,VL	FRA	4	3	3	5	5	3	3	3	9	1	1	3
132	R.C Violet	P	FRA	3	3	3	5	5	5	5	2	7	3	1	7
133	Royal de Toulous	P	FRA	3	3	3	5	5	5	5	2	7	2	1	5
134	Ruth Gerstetter	P	FRA	3	3	2	5	2	2	5	2	8	2	1	3
135	Sakarka	P	ITA	3	3	3	5	7	5	5	3	7	1	1	5
136	Satsuma	P	USA	3	3	2	5	3	3	7	2	5	3	3	3
137	Selena	P	JUG	3	3	3	5	7	7	3	3	9	1	3	3
138	Shakeaspeare	P	ITA	3	3	3	5	7	5	7	4	8	3	1	7
139	Shiro	P	USA	3	3	2	5	3	3	8	2	8	1	1	3
140	Sopernița	P	JUG	3	3	3	5	7	5	7	5	9	1	1	3
141	Stanley	P,VL	USA	3	3	3	5	7	5	7	4	9	1	5	3
142	Sugar	P	FRA	3	3	3	5	5	5	3	3	7	2	1	7
143	Thames Cross	P	ANG	3	3	3	5	5	5	7	2	5	1	1	5
144	Timpurii Shule	P	USA	3	3	2	5	5	3	3	3	9	1	1	3
145	Tragedie	P	BUL	3	3	2	5	5	5	5	3	9	1	1	5
146	Troian 1-1-2	P	BUL	4	3	3	5	5	7	3	2	8	1	1	3
147	Troian 1-48-12	P	BUL	4	3	3	5	5	7	7	2	2	2	1	7
148	Troian 14-9-23	P	BUL	4	3	3	5	5	7	5	3	9	2	1	5
149	Troian 1-8-24	P	BUL	4	3	3	5	5	7	8	2	9	1	1	5
150	Troian 2-11-40	P	BUL	4	3	3	5	5	7	5	2	8	3	1	2
151	Troian 2-4-55	P	BUL	4	3	3	5	5	7	3	2	7	1	1	7
152	Troian 2-5-24	P	BUL	4	3	3	5	5	7	5	5	8	1	1	5
153	Troian 3-11-18	P	BUL	4	3	3	5	5	7	5	2	9	3	1	5
154	Troian 3-11-5	P	BUL	4	3	3	5	5	7	7	2	3	2	1	5
155	Troian 3-13-40	P	BUL	4	3	3	5	7	7	7	5	8	3	1	5
156	Troian 3-14-8	P	BUL	4	3	3	5	5	7	5	4	9	1	1	7
157	Troianskaia Sliva	P	BUL	3	3	3	5	7	7	3	3	9	1	1	7
158	Utility	P	USA	3	2	2	5	3	3	8	2	7	2	3	1
159	Valor	P	USA	3	3	3	5	5	5	8	5	9	1	3	3
160	Vengherka Bodovaia	P	JUG	3	3	3	5	5	5	3	3	7	1	2	3

*Note: P = RIFG Pitesti – Maracineni; VL = RSFG Valcea

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STUDIES REGARDING THE IMPLEMENTATION OF HACCP (HAZARD ANALYSIS AND CRITICAL CONTROL POINTS) SYSTEM ON FRUIT CANNED PRODUCTS

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Key words: food safety, hazard

ABSTRACT

HACCP is the abbreviation for the English expression „Hazard Analysis and Critical Control Points".
To obtain high quality products-capable of meeting the consumer′s demands and complying with the European standards, it is recommended the certain risk-prevention and control methods should be applied.
In the horticultural product industry, the application of a HACCP system allows the identification of the key-elements of the technological process. The system analyses the hazard related to the fruit canned products and the process, indicating the critical control points to the hygienic quality of the product.

INTRODUCTION

On the producer-user line (from manipulation to processing) there are a high number of factors that can affect fruits quality. Considering these products as primary product for the fruit canned products or as finite product in the case of their fresh consume, the major preoccupations are in relation with pesticides level and others chemical contaminants (fertilisers), as well as to preserve the hygiene during harvesting, manipulation, processing and storage. To reduce these risks, it is necessary that the small producers, as well as the high-specialised companies, to apply prevented methods as HACCP type and not those based on the end control of products (that can affect the consumer healthy) and can induce significantly economical losses.

MATERIALS AND METHODS

The fruit canned products has been obtained by an automated technological flux, with the aid of the Materazzi equipment in the SC Contec Food Company Tecuci, Galati department, using fresh fruits (apples from cultivars :Jonathan, Golden Delicious, etc.), having as destination, the industrialisation.

A HACCP study was performed, based on the following working stages:

1. the presentation of the specifications about product;
2. the production technological flux description;
3. the potential risk identification and evaluation;
4. the critical control points (CCP) determination;
5. establish the critical limits ;
6. the monitorisation of the CCP parameters;
7. corrective actions, practised if the critical limits in CCP have been excelled;

The laborious study, was finished by HACCP Plan elaboration, a base document, which represents a guide to follow, with a view to maintain under control the relevant risks, that could affect the safety of fruit canned products .

RESULTS AND DISCUSSIONS

Risk identified during the processing of fruit canned products is concerned especially to: pesticides residue provided with the fruits, as a consequence of the phytosanitary treatments, nitrates provided by the excessive fertilisation and micro-organisms (yeast, moulds) presented on the fruits or on the technological equipment, because of the inadequate hygiene (Table 1).

As a consequence of this study, there were identified two Critical Control Points:

- Primary matter reception, for the risks generated by the pesticides and nitrates;
- Sterilization of the product, for the risks generated by yeast and moulds;

Data presented in Table 2, emphasis that for these risks, there were established the critical limits and the specifically parameters (product quantities, temperature or NTG) were controlled.

HACCP system, predicts also the critical limits surpass situation, therefore, there were predicted the corrective actions too, to determine the effect removing and the elimination of the causes which generated the manifested risk.

To assure the product traceability on all the production and commercialisation circuit, it acts to register in specifically forms, which are useful as well to HACCP system revision.

To apply the HACCP Plan, as it was realised, determines to maintain under control the relevant risks, for the food safety of the fruit canned products and to grant an adequate product for the people consume.

CONCLUSIONS

1. On the fruits canned products technology, there have been identified two Critical Control Points: at primary matter reception and at the sterilization step.
2. The established monitorization system allows maintaining the relevant risks under control, for the hygienically quality of the analysed product.

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Table 1. Hazard analysis

Processing step	Fruit canned products				Preventive /Control measures.
	Hazard				
	Kind of hazard	G	P	CR	
Reception of the fruits	B) Clostridium sp.	high	low	3	1. Training of the workers 2. Supplier assessment 3 Analytical analysis
	B) E. Coli	medium	low	2	
	B) Aspergillus flavus	medium	low	2	
	C) pesticides residue	high	low	3	
	C) heavy metal	medium	low	2	
	C) nitrit	medium	low	2	
2. Sterilization	B) Salmonella sp.	high	low	3	1) Training of the workers 2) Analytical analysis 3) Process monitoring
	B) Clostridium	high	low	3	
	B) E. Coli	medium	low	2	
	B) Aspergillus flavus	medium	low	2	
	B) Bacillus sp	medium	low	2	
	B) Staphyloccocus	high	low	3	
	B) E. Coli	medium	low	2	
	B) Aspergillus flavus	medium	low	2	

Legend: B = biological ; C = chemical; F = physical; G = gravity; P = probability; CR = risk class

Table 2. HACCP Plan

Nr crt	Process step	Relevant hazard	Characteristics	Critical control point	Critical limits	Monitoring			Corrective actions	Records
						Responsibility	Frequency	Methods		
1	Raw material reception	Pesticide residue Nitrate	-lindan -diazinon -diclorvos -etion -paration -NO_3	CCP 1	< 1 mg/kg < 0,3 mg/kg <0,1 mg/kg < 0,5 mg/kg < 0,5 mg/kg < 60 mg/kg	Laboratory technician	2 week before provide	STAS 112497/86	Interrupt contract	Analysis bulletin; -Survey report
2	Sterilization	-Yeast -Mould	Sterilization schedule	CCP 2	T=100C t=10-30min	Operator	Permanent	Automatic records	Equipment check	Sterilization report

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THE FORMATION AND EXTENSION OF THE ECOLOGICAL FRUIT GROWING

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Keywords: ecological agriculture, sustainable development, environmental protection

ABSTRACT

The alternative agriculture, which includes the ecological one as well, represents a part of the sustainable development of this section of the national economy witch answers to the harmonisation of immediate needs of agricultural products, accepted below the appearance quality and their state of health, with the laws of nature, with the request of sustainable ecological concepts. These preoccupations have intensified and currently they are contained in a rich professional literature.

Recent scientifically research from the area of agricultural sciences generated the preoccupations on the line of the appearance of alternative systems in agricultural field, considered a reply to the intensive and high-intensive agriculture, ultra specialised, chemical and big energy consumer, which in many cases doesn't justify the big production obtained.

Such preoccupations have existed since around 1924, when Rudolf Steiner (Switzerland) has put the scientifically and philosophical bases of biodynamical agriculture.

The performances obtained in Romanian fruit growing are characterised by their quality of environmental protection, of sustainable exploitation of natural resources specific to this sector of activity. Fruit growing exploitation activity is based on the practice of modern technologies, created on ecological values, on the utilisation with high efficaciousness of the photosynthesis process and the solar energy of decomposition and humidification, on the organic fertilisation and on the cultivation of covering associated plants in orchards, on integrate systems mostly bio technical, on the application of new technological methods regarding mechanisation and watering shortly.

In alternative fruit growing area a special place is occupied by ecological fruit growing, which is characterised by the environmental pollution elimination generated by fruit growing activities, the support of species' genetically biodiversity, wild species' and protection of plants and animals.

Passing to such alternative fruit growing, in the large sense of the word, must be made in time, through a process of changes with moderate tempos, that allows long-term environmental utilisation, the realisation of a sustainable economic development, at the same time with the environment quality sustain to an acceptable level.

It is known that the natural factor – the soil – has an ecological function of environment protection, the biodiversity preservation and sustainable development. This ecological function expresses itself by the natural factor contribution-soil, for:

- The production of vegetal biomass, witch provides animal food, reutilisable energy and raw materials;
- The filtration and the transformation between the atmosphere, subterranean water and vegetal carpet, protecting the environment;
- Habitat conditions insurance and the gene sock, the fauna and flora from the soil that mean an important part of biodiversity.

In this context, in the last decade in Romania as well, the preoccupations regarding the formation and extension of a new economic section, dynamical, in assertion, as part of the

process of sustainable development of agricultural and rural space, the ecological fruit growing has intensified.

In Romania, the ecological yield is definite by the obtain of agro alimentary products without the utilisation of the synthesis chemical products, according to the ecological rules that respect the standards, the guides and the exercise books of national tasks and are certified by an inspection and certification body created in this aim.

The agro alimentary production has the purpose to realisation of sustainable agricultural systems; diversified and well balanced that assures natural resources protection and the health of the consumers.

The ecological production methods used for obtaining some unprocessed vegetal products (where fruit are included) of the animals and unprocessed animal products as well as those processed (for example, fruit products) produced for human consumption, as well as food from one or more ingredients of vegetal origin and /or animal, a food animal and raw materials must fulfil the following conditions:

- ❖ The accomplishment of the ecological production values;
- ❖ Non utilisation of fertilisers and substances that improve the soil, pesticides, fodders, adductive feedings, food ingredients, substances used in animals feeding, products for cleaning and disinfections of animal stables and other products, than the ones allowed to be used for ecological agriculture;
- ❖ The use of seeds or planting vegetative material obtained through ecological production methods.

Main objectives of ecological agro alimentary production are:

- Obtaining agricultural products with high nutritional qualities in sufficient amounts;
- The application of work methods compatibles with the environment, instead of trying to dominate the nature;
- The elimination of any polluting technology;
- The continuous sustain and the improvement of soil's natural fertility;
- The integration of animal growing in the plant and plant products production system;
- The economical utilisation of conventional power resources and their substitution by the rational utilisation of secondary reusable products;
- The implementation of some technologies for plant culture and for animal growing, that satisfies the requests of the species, soils and rases.

Taking into consideration the world trends and considering the natural favourable conditions of which our country disposes, as well as the raising requirements of the ecological agro alimentary products, on the external and internal market, especially in the recent years, the development of the ecological agricultural section is based as a special opportunity. This is shown by the ecological certified surfaces development, presented in the table 1.

In 2004, the ecological surface was 75500 ha comparing to the year 2000, when it was only 17438 ha, what means a growth of 4,3 times. Positive development, significantly were registered to all cultivated surfaces.

In ecological fruit growing, in the year 2002 were cultivated the first lots with cherry, containing 50 ha, and in 2004 grew up to 200 ha. Forest fruits (raspberry, blueberries and nuts) were cultivated in the year 2004, on a surface of 500 ha, 10 times bigger than in 2000.

The same tendency can be seen regarding ecological certified productions development.

In the fruit growing section we see that fruit production (cherry and morello cherry) was, in 2002, of 200 tons and in 2004 it was of 800 tons. At forest fruits (raspberry, blueberries and nuts), in 2000 a harvest of 200 tons was obtained, and in 2004 of 500 tons.

This beginning in ecological fruit growing development, shown by the obtained results is based as a logical support of this sector 's necessity to expand.

The strategy of sustainable development of agriculture and feeding, with all modifications that may appear in her scroll puts ecological fruits growing in the centre of fruit growing activity development, being considered an engine of sustainable development. According to MAPDR, at the horizon of 2025, the cultivated surface as part as the ecological surface will represent 3% from the agricultural surface of the country, meaning around 450 000 ha.

Certainly, some of impediments can be over fulfilled by using new production procedures, based on the new technique and technological way of production, in development and assertion. To these is added the granted support of the competent public authorities in the process of he technological agriculture expand.

Ecological agriculture from the economical and ecological point of view, represents the support of obtaining new clean products, healthy for humans and animals, as well as the one of long- term improvement of natural funds, including soil quality.

Ecological agriculture products have always been more expensive than the ones obtained in conventional systems, situation that seems to be considered another obstacle in ecological agriculture development. The reality shows that more and more consumers afford to pay a bigger price in the change of quality guarantee and food safety.

Even in our country, even if in the past the ecological products were hard to find or to procure, today they can be found on the shelves of big commercial chain shops, in a big variety of sentiments.

Therefore, a market in expansion represents a factor that encourages agricultural producers to reconvert their cultures in the ecological production area. As a consequence, the expenses generated by the agro ecological system represents a trump in the competition fight on agricultural markets, they being retrievable ecological products are characterised by a high level of profitability, as a result of the practice of some high prices.

The growing importance that E.U. grants by our country as well, to the process of expansion of the production and ecological agriculture, as well as the importance of agricultural products transformation and distribution conditions shows this fact.

The conclusion drawn is that the expand of the ecological fruit growing section in the conditions of some objective limits manifestation will never be able to entirely assure the food needs of the population, continuously growing and diversification. Therefore, the humanity will use other alternative systems of agricultural production as well for the assurance of the Earth's population food safety.

But, on this objective background, the fruit growing will develop because ecological fruit growing products won't be addressed only to a reduced segment of population, defined by some specialists with a little eccentrics, but because of their special quality, for a clean and healthy alimentation and will contain a bigger and bigger number of consumers, according to the population's income increase.

The ecological fruit growing represents just an alternative to intensive conventional fruit growing, that shows its limits and the cortege of negative consequences on the quality of obtained products and the environment, as a result of the irrational use of chemical substances that damages humans, animals and soil's health.

Therefore, future's fruit growing can't just be ecological agriculture, but a sustainable one, integrated and ecological. It will be an agriculture that joins harmoniously the biological, microbiological and industrial aspects, all based on ecological and economical values.

With time, as the humanity will gain experience, when the new technical and technological way of production neofactorial will generalise, the passing to an eco-fruit-growing will be possible, that bases itself on eco techniques, keeping positive aspects of ecological agriculture.

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Table 1. The development of certified surfaces in ecological agriculture

Specification	**U.M**	**Years**				
		2000	**2001**	**2002**	**2003**	**2004**
Total vegetal quantity, from which:	Ha	17438	28800	43850	57200	75500
Cereals	Ha	4000	8000	12000	16000	24500
Green crops and pasture land	Ha	9300	14000	20000	24000	27000
Oleaginous and proteins	Ha	4000	6300	10000	15600	22100
Vegetables	Ha	38	100	700	200	300
Fruits	Ha	-	-	50	100	200
Forest fruits (raspberries, blueberries, nuts)	Ha	50	100	300	400	500
Other cultures	Ha	50	300	800	900	900

Source MAPDR: The strategy of sustainable development of agriculture and feeding in Romania.

Table 2. The development of vegetal productions ecologically certified

Specification	U.M	Years				
		2000	2001	2002	2003	2004
Total vegetal quantity, from which:	To	13502	24400	32300	30400	55590
Cereals	To	7200	12500	15000	14400	30500
Oleaginous and proteins	To	5500	7200	9000	12480	19890
Vegetables	To	600	4000	7000	2000	3000
Fruit	To	-	-	200	400	800
Forest fruit (raspberries, blueberries, nuts)	To	200	400	300	320	500
Other cultures	To	2	300	800	900	900

The source MAPDR

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THE FRUITS QUALITY TO SOME APPLE MUTATIONS OBTAINED FROM INDUCTION MUTAGENESIS

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ABSTRACT

The analysis of the apple fruits quality from 2006 harvest from the Fruit Research Station Voinesti were made at the following selections obtained in this farm using induction mutagenesis: H1/26, H4/50, H9/98, H9/11, H3/23, H5/79, H4/103, H5/56 and H6/42. The quality of the apple fruits was pointed out through weigh, with Turoni penetrometer for establish the firmness of the pulp and the classical methods for determine the content in: water, total dry matter, soluble solids, vitamin C and total acidity. After the obtaining results we come to the conclusion that the most valuable hybrid selections were H6/42 and H4/103, which had big fruits (more than 200 g), with agreeable appearance and high content in soluble solids.

INTRODUCTION

From apple breeding methods, the induction mutagenesis was one of the most certainly and efficacious methods for obtaining valuables cultivars. The researches had made in Romania by Petre Valeria (2001) proving that through this method can be obtained remarkable cultivars. For this, the cultivars Redix and Iris and a series of elites prove the existence of one sure opportunity of obtaining valuable cultivars using this method. At Voinesti were noticed many remarkable elites which make the purpose of homologation for a new assortment. New cultivars, with a very high disease resistance at scab, beside Redix and Iris, have the opportunity to be promoted and to replace the cultivars Frumos de Voinesti and Starkrimson (Petre V., 2006).

MATERIALS AND METHODS

For estimation the apple quality harvested in 2006 at Fruit Research Station Voinesti were analysed fruits from the selections: H6/42, H4/50, H5/79, H9/11, H3/23 H9/98, H4/103, H5/56 and H1/26.

The apple quality analysis was realised based on physical and biochemical parameters.

Among the physical parameters were analysed fruit weighing and pulp firmness using Turoni penetrometer.

Among the biochemical parameters were analysed content in: water, total dry matter, soluble solids, vitamin C and total acidity. Total dry matter and soluble solids were determined with Reichert Brix 35 HP refractometre, vitamin C with iodometric method and total titrable acidity with NaOH n/10.

RESULTS AND DISCUSSIONS

The analysis was made at the fruits harvested on 2.09.2006 and 13.09.2006. At fruits harvested on 2.09.2006 the weight average was of 138.31 g (H9/11) till 208.00 g (H6/42). There were fruits more firm 8.21 kgf/cm^2 (H5/79) and less firm 4.20 kgf/cm^2 (H6/42). At this date water content was bigger, 85.86-86.80%, total dry matter oscillated between 13.20% and 14.14%, soluble solids between 10.93% and 12.66%, vitamin C between 11 mg and 32.59 mg/100 g fruit and acidity 0.231% and 0.463%. The hybrid H5/79 was different, with firm fruits and a big contain in dry matter and vitamin C.

At the fruits harvested at 13.09.2006, the weight average was variable depending on selection, water contain was smaller (81.25-83.96%), total dry matter and soluble solids registered a small increase (12.26-13.06%), vitamin C maintained at a constant level, between 24.00 mg/100 g and 32.42 mg/100 g fruit and acidity between 0.276% and 0.529%.

A comparative analysis of these parameters among the hybrids fruits selections pointed out the selection H4/103, with firm fruits (8.52 kg/cm^2), smaller water content (81.25%) but bigger in total dry matter (18.72%).

CONCLUSIONS

Among the researched selections were pointed out through weight and fruits quality H6/42, with fruits harvested at 2.09.2006 and H4/103, with the harvest at 13.09.2006

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Fig. 1 – The quality of the fruits at H 6/42

Fig. 2 - The quality of the fruits at H 4/103

Table 1

The values of some physical and biochemical parameters of some apple hybrids obtained from induction mutagenesis, fruits qualities indicatives

Hybrid	Harvest date	Average fruits weight (g)	Fruits firmness (kgf/cm^2)	Water content (%)	Total dry matter (%)	Soluble solids (%)	Vitamin C (mg/100 g fruit)	Total acidity (%)
H6/42	2.09.2006	208.00	4.20	85.86	14.14	12.66	16.21	0.463
H4/50	2.09.2006	160.00	7.80	86.80	13.20	11.96	32.59	0.386
H5/79	2.09.2006	149.45	8.21	82.36	17.64	12.80	31.58	0.231
H9/11	2.09.2006	138.31	4.50	85.92	14.08	10.93	11.00	0.351
H3/23	13.09.2006	158.53	7.85	83.34	16.66	13.06	27.78	0.529
H9/98	13.09.2006	183.63	8.15	82.36	17.64	12.60	32.42	0.276
H4/103	13.09.2006	214.80	7.72	83.93	16.07	13.66	24.00	0.242
H5/56	13.09.2006	150.66	8.52	81.25	18.75	12.53	26.78	0.362
H1/26	13.09.2006	179.00	8.00	83.79	16.21	12.26	25.88	0.372
Average		171.38	7.22	83.96	16.04	12.50	25.36	0.360

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COMPARISON BETWEEN PEACH-TREE WATER CONSUMPTION AND A DIFFERENT METHOD OF REFERENCE EVAPOTRANSPIRATION (ETO) CALCULATION IN THE CONDITIONS OF NORTH WESTERN ROMANIA

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Keywords: water consumption, crop coefficient, irrigation scheduling, drip irrigation, micro sprinkler irrigation.

ABSTRACT

The paper presents the results obtained during 2000-2003 at the no irrigated and the irrigated by drip and micro sprinkler peach-tree. These methods are being compared with those for evapotranspiration reference determination: Thorntwaite, pan Class A, Piche evaporimeter, Penman-Monteith. There is a different peach-tree situation,, the water consumption and the values of the reference evapotranspiration are specific. The results obtained underline the need of the crop coefficients use for the reference evapotranspiration transformation into peach-tree optimum water consumption.

INTRODUCTION

The plants' water consumption knowledge is very important for both irrigation design and irrigation scheduling (Grumeza et all, 1989, Grumeza and Kleps, 2005). The best methods for reference evapotranspiration don't give similar results with the values of the plants water consumption (Doorembos and Pruitt, 1992, Domuța, 1995, 2003, 2005) and the crop coefficient (Kc) for transformation of the reference evapotranspiration in the optimum water consumption of the plants are necessary. The paper presents the results obtained during 2000-2003 in Oradea.

MATERIALS AND METHODS

The researches were carried out in an orchard planted in 1996. The cultivar used was Superb of Autumn.

The peach-tree water consumption was obtained using the soil water balance method; the depth of the water balance was of 0-150 cm.

Three variants were studied: 1) Nonirrigated; 2) Drip irrigated 3) Micro sprinkler irrigated. In the irrigated variant, the soil water reserve on 0-150 cm was maintained between the easily available water content and the field capacity determining the soil moisture every ten days. The irrigation regime included an irrigation rate of 376.7 mm in 2000 143.0 mm in 2002, 152.0 mm in 2003. The annual rainfall during the studied period was of 527.4 mm in 2000, 868.5 mm in 2001, 437.5 mm in 2002, 501.1 mm in 2003.

The Bac evaporation and the Piche evaporation were determined every day at 8 o'clock by the same person. Three Bac evaporimeters and three Piche ones were used.

Thorntwaite and Penman-Monteith values of the reference evapotranspiration were calculated using a known formula (Botzan, 1966, Domuța, 2005).

RESULTS AND DISCUSSION

The differences between the water consumption of the peach-tree and the reference evapotranspiration (ET_o)

The daily water consumption of the nonirrigated peach-tree increased from April (2.43 mm/day) to June (3.66 mm/day) and decreased after that. In irrigated conditions, in both drip and micro sprinkler conditions, the maximum daily water consumption was registered a month later than in nonirrigated conditions. In irrigated conditions the values of the daily water consumption of the peach-tree were bigger than the values registered in the nonirrigated variant every month (table 1)

In comparison with the peach-tree water consumption in nonirrigated conditions, the values obtained for the reference evapotranspiration (ET_o) determined by the Thorntwaite, Bac and Piche evaporimeters and Penman-Monteith methods present different situations. All the months, the closest values to the ETR (real evapotranspiration obtained in no irrigated variant) were obtained in ET_o Thorntwaite, in April, May, June and July the differences were insignificantly and in August and September were very significant (optimum evapotranspiration obtained in the irrigated variant, maintaining the soil moisture between easily available water content and field capacity).

In comparison with ETR_{opt} of the peach-tree with drip irrigation, the closest monthly values of the reference evapotranspiration were registered using the Bac evaporimeter in April, June, and July and using the Thorntwaite method in May, August and September. In comparison with ETR_{opt} on the peach-tree irrigated using the micro sprinkler method, the closest values were obtained using the Thorntwaite method in May and August, the Bac evaporimeter in July, Penman-Monteith in April, June and September. This situation emphasized the statistically assured differences between ETR and ET_{opt} of the peach-tree and ET_o determined using different methods and the need of the crop coefficient „Kc" use for the ET_o transformation into the water consumption of the peach-tree.

The differences between the total water consumption of the peach-tree and the reference evapotranspiration (ET_o)

Between both peach-tree water consumption in nonirrigated conditions and in conditions of drip or micro sprinkler irrigation, the values of the reference evapotranspiration (ET_o) calculated using 4 methods, the differences are statistically assured (table 2)

In comparison with the water consumption of the nonirrigated peach-tree, the closest value was obtained using the Thorntwaite method; a similar situation was obtained when the values of the drip irrigated variant were compared. When the Penman-Monteith method was used, the closest value of the water consumption in micro sprinkler irrigation was obtained.

Crop coefficient „Kc"

The data regarding the peach-tree water consumption in drip and micro sprinkler irrigation conditions and the reference evapotranspiration (ET_o) determined using the Thorntwaite, pan Class A, Piche and Penman-Monteith methods, permitted the calculation of the crop coefficient (Kc). These coefficients transform the reference evapotranspiration into peach-tree water consumption in drip and micro sprinkler irrigation conditions. Tables 3 and 4 present the values of the crop coefficient for every reference evapotranspiration method. These coefficients can be used in the irrigation design – Kc for ET_o Thorntwaite or ET_o Penman-Monteith, because the registration of the climate data includes a big number of years, or in irrigation scheduling – Kc for ET_o pan Class A and Piche evaporimeter.

CONCLUSIONS

There are different situations of the reference evapotranspiration (Eto) values in comparison with the daily water consumption of the peach-tree in drip and micro sprinkler irrigation. These situations sustain the need for the crop coefficients (Kc) use in irrigation scheduling.

Comparing the peach-tree water consumption of the nonirrigated variant with the reference evapotranspiration values, the closest value was registered using the Thorntwaite method. In comparison with the water consumption from the variant with drip irrigation, the same situation was registered.

In comparison with the total water consumption of the peach-tree from the variant with micro sprinkler irrigation, the closest average value was registered using the Penman-Monteith method.

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Tables

Table 1. Daily water consumption (ETR) and daily optimum water consumption (ETR_{opt}) of the peach-tree in comparison with the reference evapotranspiration (ET_o) determined using different methods, Oradea 2000-2003

Variant	April	May	June	July	August	September
1.ETR	2.43	3.56	3.66	3.39	1.62	1.13
2.ETR_{opt} drip irrigation	2.61	3.72	4.22	4.89	3.72	1.54
3.ETR_{opt} micro sprinkler	2.74	3.87	4.78	5.13	3.43	1.75
4.ET_o Thorntwaite	1.91	3.82	4.45	4.68	4.27	2.54
5.ET_o Bac evaporimeter	2.6	4.14	4.63	4.8	4.76	2.70
6.ET_o Piche evaporimeter	3.64	5.21	6.22	6.49	6.45	3.52
7.ET_o Penman-Monteith	2.56	4.07	4.92	4.55	4.67	2.49
Statistically appreciation of the differences between ETR and ET_o						
LSD 5%	0.7	0.9	1.1	1.3	1.2	1.0
LSD 1%	1.4	1.6	2.2	2.5	2.6	2.1
LSD 0.1%	3.6	3.9	4.2	4.7	4.9	3.9
Statistically appreciation of the differences between ETR_{opt} in drip irrigation and ET_o						
LSD 5%	0.4	0.6	0.4	0.4	0.7	0.6
LSD 1%	1.2	1.5	0.9	1.0	1.4	1.3
LSD 0.1%	2.5	2.7	1.9	2.1	2.3	2.2
Statistically appreciation of the differences between ETR_{opt} in micro sprinkler irrigation and ET_o						
LSD 5%	0.9	0.6	0.5	0.7	0.6	0.9
LSD 1%	2.1	1.5	1.3	1.5	1.6	1.6
LSD 0.1%	3.7	2.4	2.7	2.5	2.3	3.1

Table 2. Differences between the water consumption (ETR) of the nonirrigated peach-tree, the optimum water consumption (ET_{opt}) of the irrigated peach-tree and the reference evapotranspiration (ET_o) determined using different methods, Oradea 2000-2003

Variant	Values			
	mm/ha	%	%	%
1.ETR	551.3	100	81	79
2.ETR_{opt} drip irrigation	683.0	124	100	98
3.ETR_{opt} micro sprinkler irrigation	700.2	127	103	100
4.ET_o Thorntwaite	662.9	120	97	95
5.ET_o Bac evaporimeter	722.6	131	106	103
6.ET_o Piche evaporimeter	963.9	175	141	137
7.ET_o Penman-Monteith	711.2	129	104	102
Statistically appreciation of the differences between ETR and ET_o				
LSD 5%	37.0			
LSD 1%	72.0			
LSD 0.1%	137.0			
Statistically appreciation of the differences between ETR_{opt} in drip irrigation and ET_o				
LSD 5%	21.4			
LSD 1%	57.0			
LSD 0.1%	112.0			
Statistically appreciation of the differences between ETR_{opt} in micro sprinkler irrigation and ET_o				
LSD 5%	21.0			
LSD 1%	51.2			
LSD 0.1%	109.8			

Table 3. Values of the crop coefficient „Kc" for the transformation of the reference evapotranspiration (ET_o) in the optimum water consumption of the drip irrigated peach-tree, Oradea 2000-2003

Method	April	May	June	July	August	September
1.Thorntwaite	1.42	0.98	1.04	1.03	1.01	0.78
2.Bac evaporimeter	1.05	0.97	1.03	1.00	0.98	0.81
3.Piche evaporimeter	0.74	0.75	0.77	0.74	0.55	0.47
4.Penman-Monteith	1.06	0.94	0.96	1.06	0.76	0.69

Table 4. Values of the crop coefficient „Kc" for the transformation of the reference evapotranspiration (ET_o) in the optimum water consumption of the micro sprinkler irrigated peach-tree, Oradea 2000-2003

Method	April	May	June	July	August	September
1.Thorntwaite	1.47	1.00	0.56	1.10	0.78	0.69
2.Bac evaporimeter	1.07	1.09	1.07	1.06	0.74	0.65
3.Piche evaporimeter	0.78	0.74	0.75	0.71	0.54	0.50
4.Penman-Monteith	1.11	0.96	0.92	1.15	0.73	0.74

Lucrări ştiinţifice U.Ş.M.A.V.B., Seria B, Vol. L, 2007

SOME ASPECTS REGARDING SOIL MANAGEMENT SYSTEMS IN A PEACH TREE ORCHARD

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Keywords: peach tree, soil management systems, soil physical properties, fruit yield

ABSTRACT

The purpose of this paper is to determine how much soil physical properties and fruit tree parameters are affected by application of crop-soil technologies usually utilized in peach fruit growing under the natural conditions of Constanta, southeastern Romania. There are some interesting aspects even the following results are observed after two years of study in this experience. The soil showing the maximum occurrence in the region is a chernozem type and the climate conditions during the experiment were more or less typical for Constanta, in the southeastern part of Romania. The experimental design consisted of three factors: factor A-soil management system between tree rows with two graduations: a1- mowed sod strips, with grass, and a2- cultivated strips, by plowing and three-time disking. The factor B is soil management system on the rows with two graduations: b1- cultivated strips, by herbicidation, b2- groundcover crop left *in situ* as mulch. The factor C is nitrogen dose, which is applied in spring with three graduations: c1-N_{30}, c2- N_{60}, c3-N_{90}. Regarding physical properties of the soils although in only two years of researches there aren't clear differences, it was observed a positive influence in mowed sod strips variants. Fruit production was positive influenced in cultivation variant, comparing with mowed sod strips in both years of studies.

INTRODUCTION

The influence of mowed sod system with grass on the proprieties of the soil was emphasized especially in the areas with higher precipitations in not irrigation conditions (Pomicultural Basin Arges, in the center of the country).

There are few researches regarding these aspects in areas with inferior water provision in irrigated conditions as is in Constanta.

Organization of this research by the applying of some variants of maintenance management of the soil on different levels of fertilizing with nitrogen is necessary for answering the problems regarding improvement of physical properties, preserving fertility of soil, reduction of negative effects of water deficit in the soil.

MATERIAL AND METHODS

The experiment was started in spring 2002, at *Fruit Research Station Constanta*, located southeastern Romania, on a field with peach trees, Springcrest variety, at maximum yield fruiting (10^{th} year of planting). The distances used were 4m/2m, resulting a density of 1250 peach trees per hectare.

The experimental design consisted of three factors:

Factor A-soil management system between tree rows with two graduations:

a1- mowed sod strips, with grass, and

a2- cultivated strips, by plowing and three-time disking.

The factor B is soil management system on the rows with two graduations:

b1- cultivated strips, by herbicidation

b2- groundcover crop left *in situ* as mulch

The factor C is nitrogen dose (kg N ha^{-1}) which was applied in spring with three graduations: c1-N_{30}, c2- N_{60}, c3-N_{90}.

It resulted 12 variants arranged by subdivided plots method, with 4 repetitions. Each variant/repetition included 5 peach trees, resulting 240 peach trees in whole experiment.

The experiment was placed on a plane field, on Chernozem type containing calcium carbonates from the AC horizon downwards.

On 20-80 cm depth where are located most of the roots, the soil presented the following physical and chemical properties: contents of clay with particles smaller than 0,002 mm -32,5%, bulk density 1,27 gcm^{-3}, hydraulic conductivity 9,08 mmh^{-1}. Content of humus was 3,3%, total nitrogen 0,117mg in 100g of soil, total potassium 0,165 mg in 100g of soil.

In each of soil management systems between rows (factor A) the soil profile was made till 40 cm depth. Soil samples at every 10 cm depths were taken in metal cores, 100 mm diameter and hight, four repetitions for each depth. We made determinations regarding bulk density, saturated hydraulic conductivity, total porosity and macroporosity. Fruits production in year 2003 was registered by weighing production collected on each variant/repetition (5 peach trees for each of them) expressed in tons per hectare. The production values were processed by variance analysis.

Between three factors analyzed, two (A, C) are qualitative factors, being different only by name while the third (C) is quantitative factor having a graduation with three values: 30, 60,90 kg Nha^{-1}.

So, means of factors and their interactions were compared with limit differences for probability of 5% (DL5%).

MATERIALS AND METHODS

The preliminary results regarding the influence of soil management system between the rows of peach trees on physical properties of soil after first year of experiment are shown in figures 1-5.

After such short time of orchard cultivation variant, differences in some properties of soil are visible.

So, bulk density-BD included between 1,26 and 1,33 gcm^{-3} and has a zigzag variation, figure 1. Better values (lower density at higher depths) are noted at mow sod strips variant, but there aren't significant differences till now.

Total porosity-TP depends on BD. Because BD wasn't siginficant differences till now, neither TP don't registred significantly different between analized variants, figure 2. Values TP are more than 50% in all cases and these shows the soils are well aerated.

Neither hydraulic conductivity- Ks is significantly different between mow sod strips and cultivated strips (figure 3). Ks is between 8 and 10 mmh^{-1}. It characterizes the soil as medium permeable for water (Canarache, 1990).

One physical property of the soil which differs significantly in the layer up to 20 cm depth after two seasons of research is macroporosity of soil, P_{50}, figure 4. That was superior in mow sod variants, because of the positive effect of activity of grasses' roots between rows of peach trees.

Penetration resistance-PR shows a clear difference between mowed sod strips and cultivated strips (figure 5). The variants studied are significant differenced on all depths (0-40 cm). The mowed sod strips with grass was more resistant, with possible effects on development of peach trees's roots.

The influence of soil management system between the rows (factor A) on fruit production is presented on figure 6. After 2 seasons of plant cultivation, we can see that cultivated strips (a1) had a more positive influence on fruit production than moved sod strips with grass (a2).

It was previous observed at other species as apple trees, plum trees (Iancu, 1998, 1999, 2000) or peach trees (Popa, 1986) probably because is a strong competition for water and nutrients between peach tree and grasses.

Figure 7 presents the influence of factor B on fruit production. In the two seasons of cultivation there weren't significant differences between b1 (herbicidation on the peach tree row) and b2 (mulch on peach tree row).

Also, application of nitrogen fertilizers with graduation: 30, 60, 90 kg Nha^{-1} (factor C) diversified fruit production. In 2002, the differences between variants were significant but in an unexpected way, higher fertilizer rate caused lower fruit yield. In 2003 the relation was opposite, but differences were insignificant (figure 8).

It is possible that on fertile soils at the experimental plots, which has high humus content and good quality, the nitrogen applied wasn't so important in 2002.

The interaction of the two soil management systems between the peach tree rows (A) and on the rows (B) was visible in the same sense in 2002 and 2003, figure 9. Factor A presented a stronger influence than factor B.

Factor B presented a statistic significant only in 2003, in the first group between a1b1 and a1b2, graph 9.

The interaction between soil management system between the peach tree rows (A) and the fertilization system (C) is presented on figure10. The strong influence of factor A is observed on both years of research, through the differences of group a1c1, a1c2, a1c3 and the group a2c1, a2c2, a2c3. Factor C produced significant differences only in 2003, in group a1c1, a1c2, and a1c3 as we can see from graph 10.

The interaction between soil management system on the peach tree rows (B) and the fertilization system (C) indicate a positive influence at increasing N fertilization on fruit production in 2003, graph 11, more visible in b1 than in b2 system.

The complex interaction of factors AxBxC

The fruit production investigated is presented on figure 12.

This group shows individual values regarding peaches production together with limit differences of 5%, in 2002 and 2003.

Factor A-the soil management system between tree rows had a strong influence with differences in a significant way the group of variant a1 (with a1b1c1, a1b1c2, a1b1c3 and a1b2c1, a1b2c2, a1b2c3) from group a2 (with a2b1c1, a2b1c2, a2b1c3 and a2b2c1, a2b2c2, a2b2c3).

RESULTS AND DISCUSSION

Regarding physical properties of the soils although in only two years of research there aren't clear differences, it was observed a positive influence at mowed sod strips variants.

Fruit production was positively influenced by cultivation of soil between tree rows, comparing with mowed sod strips in both years of studies.

Nitrogen fertilization, with three graduations of 30, 60, 90 N ha^{-1}diversified fruit production. In 2003, the differences between variants were in a direct relation with the quantity of N, but weren't significant.

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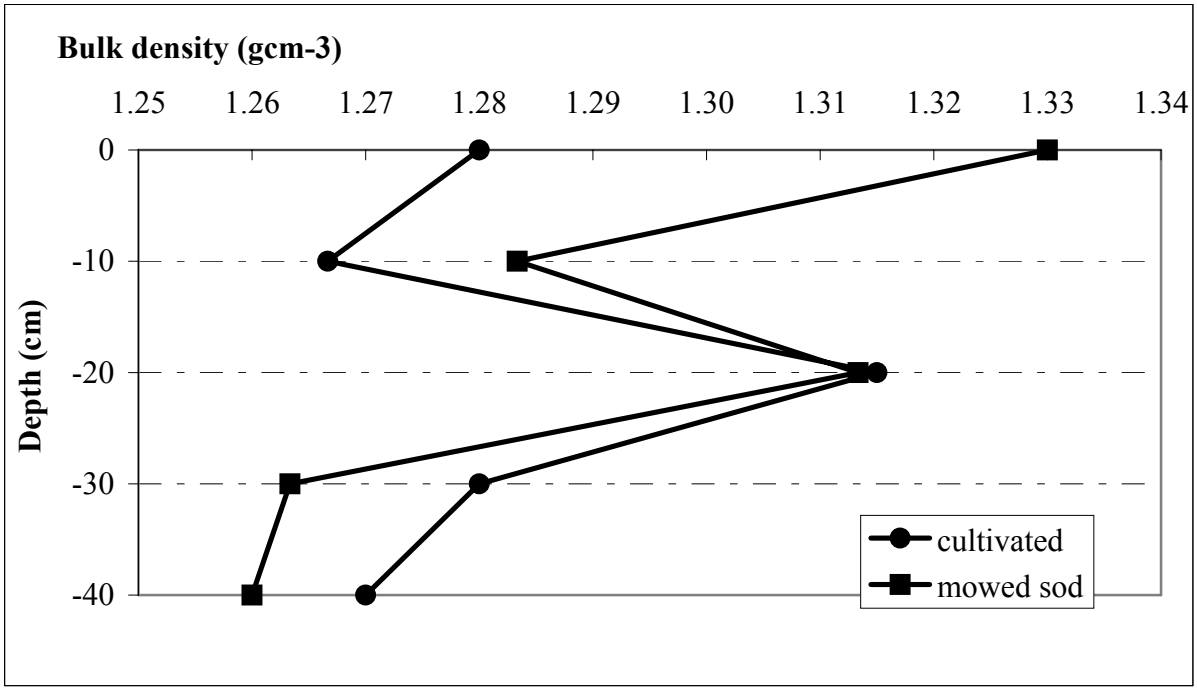

Fig. 1. Bulk density found in two soils management systems, in 2003, Constanta

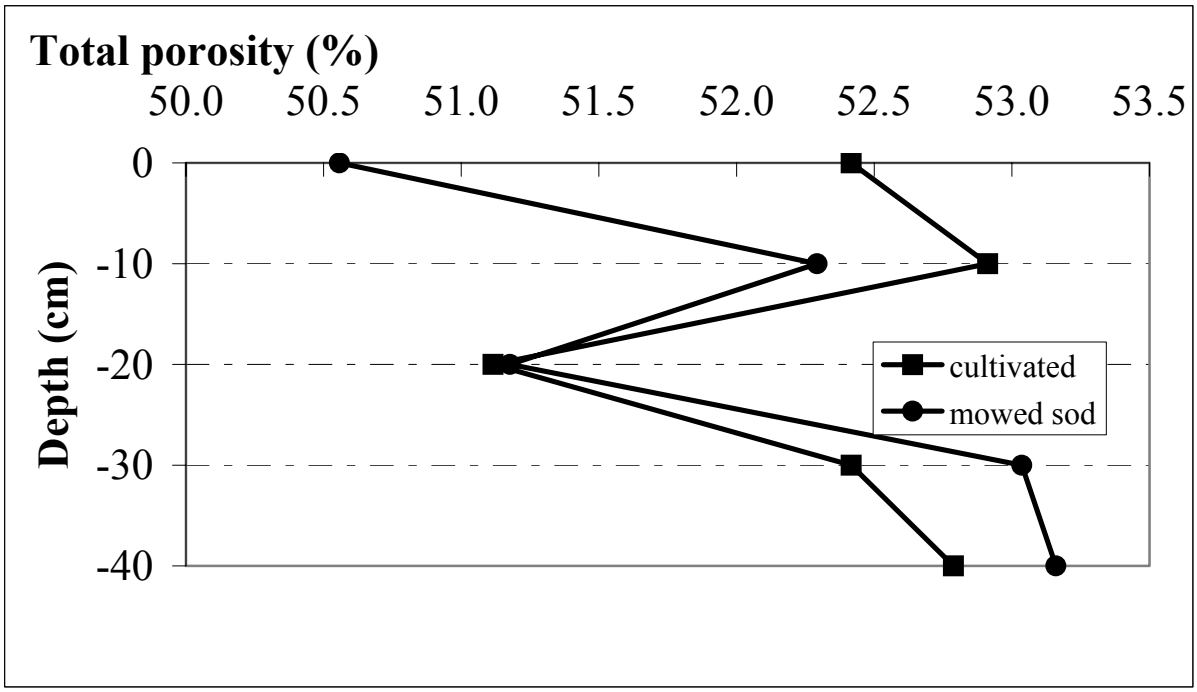

Fig. 2. Total porosity found in two soils management systems, in 2003, Constanta

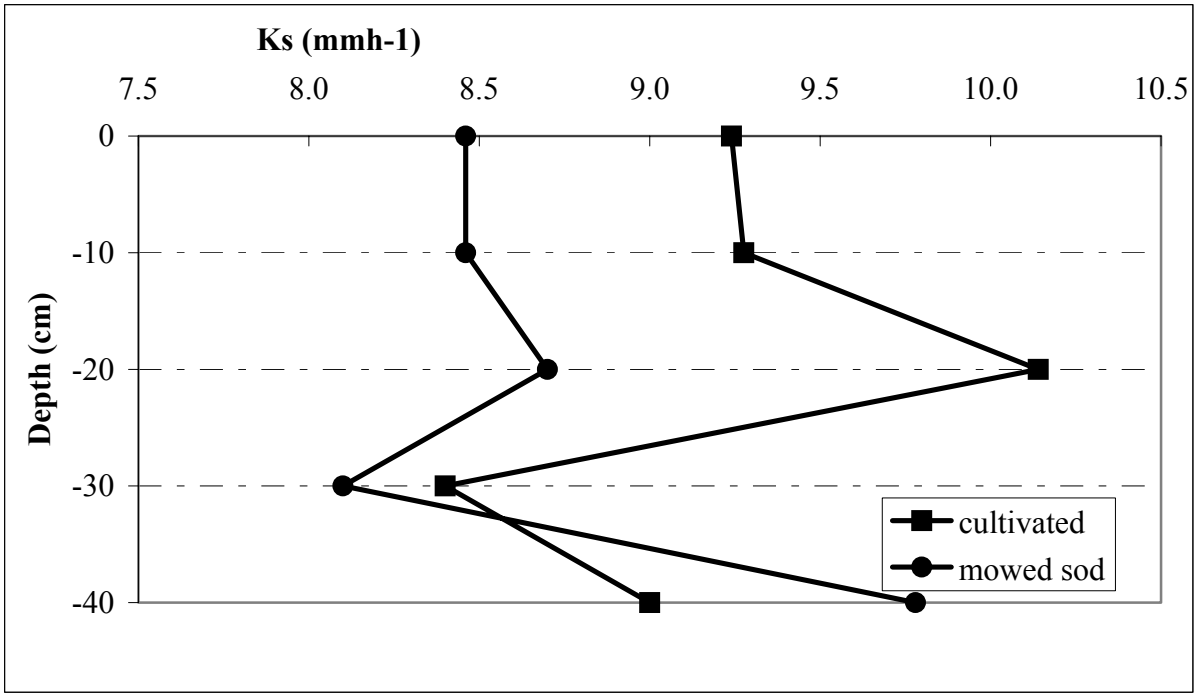

Fig. 3. Hydraulic conductivity found in two soils management systems, in 2003, Constanta

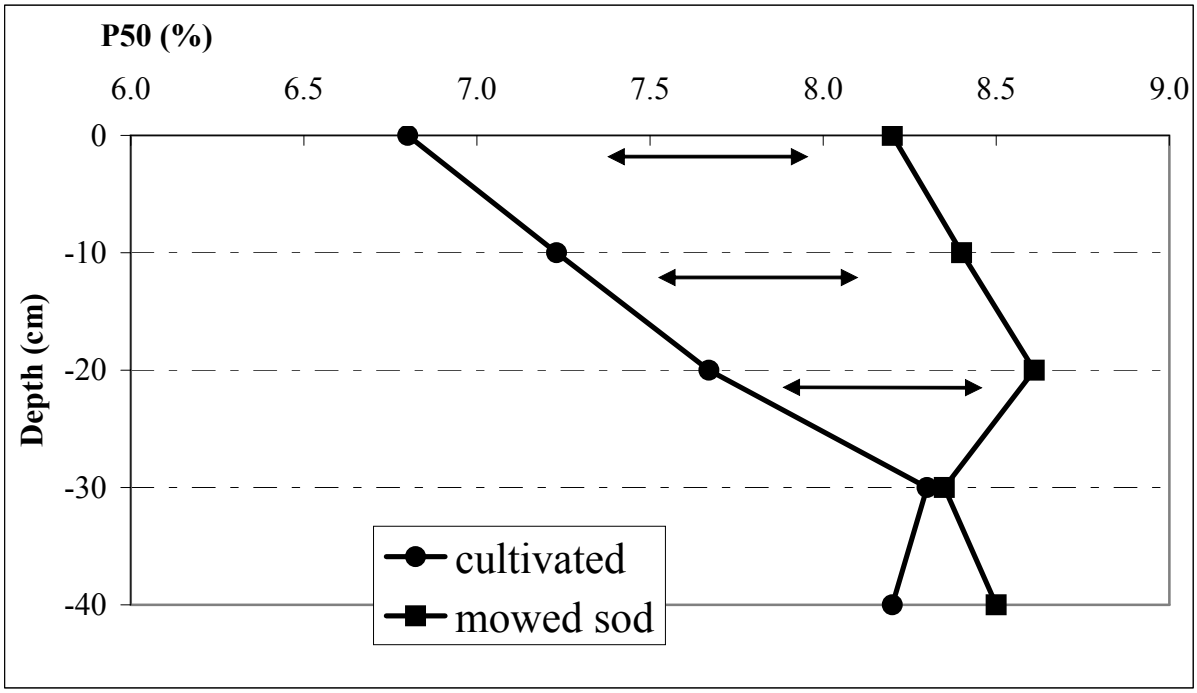

Fig. 4. Microporosity found in two soil management systems, in 2003, Constanta; the arrows indicate DL 5%

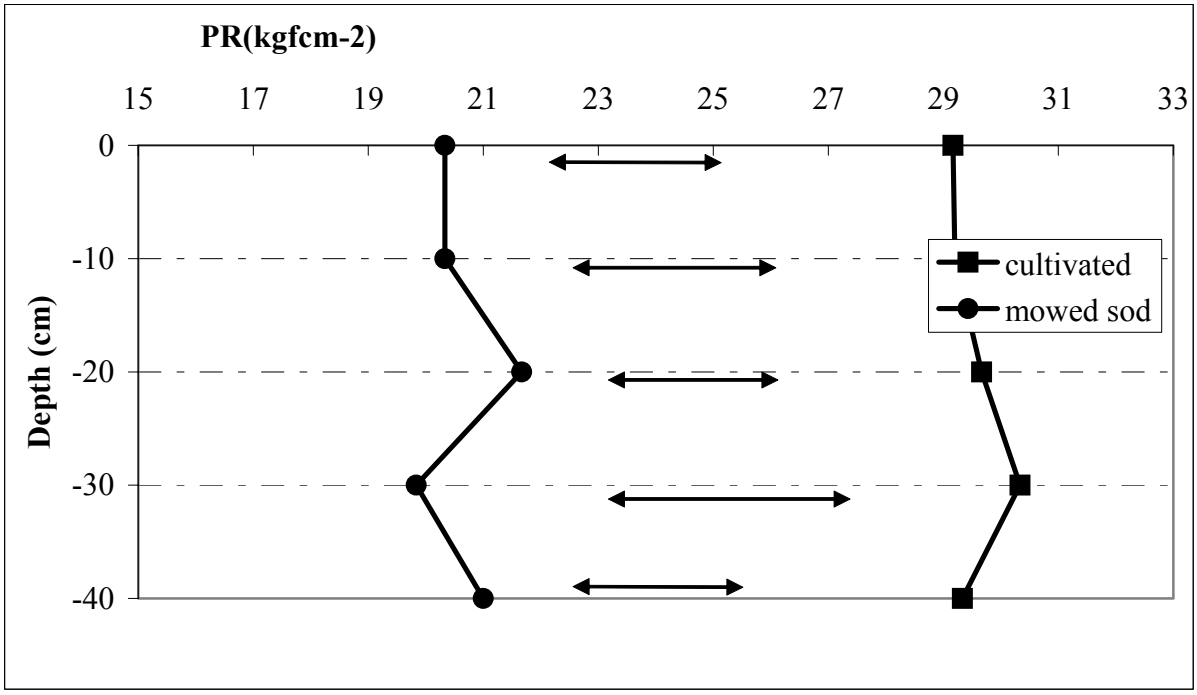

Fig. 5. Influence of soil management systems on PR, in 2003, Constanta; the arrows indicate DL 5%

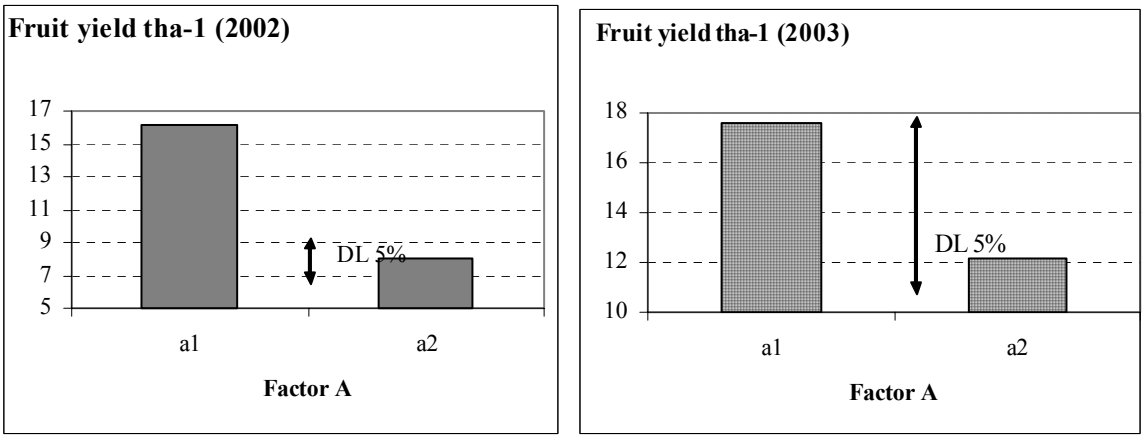

Fig. 6. The fruit production in studied variants grouped together in function of factor A

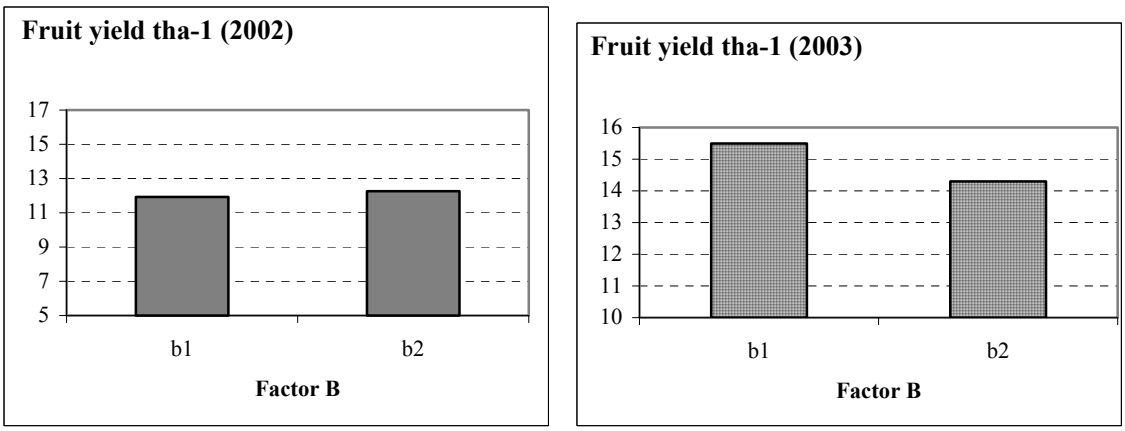

Fig. 7. The fruit production in studied variants grouped together in function of factor B

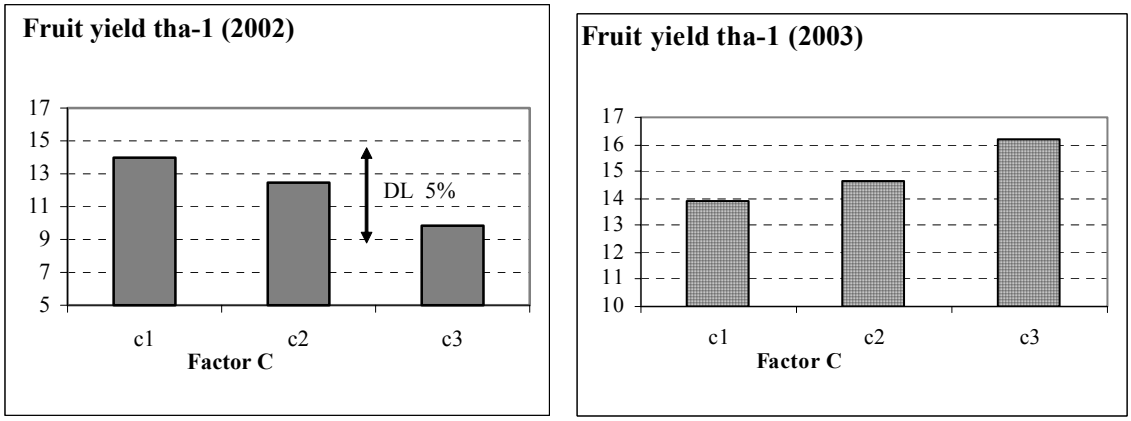

Fig. 8. The fruit production in studied variants grouped together in function factor C

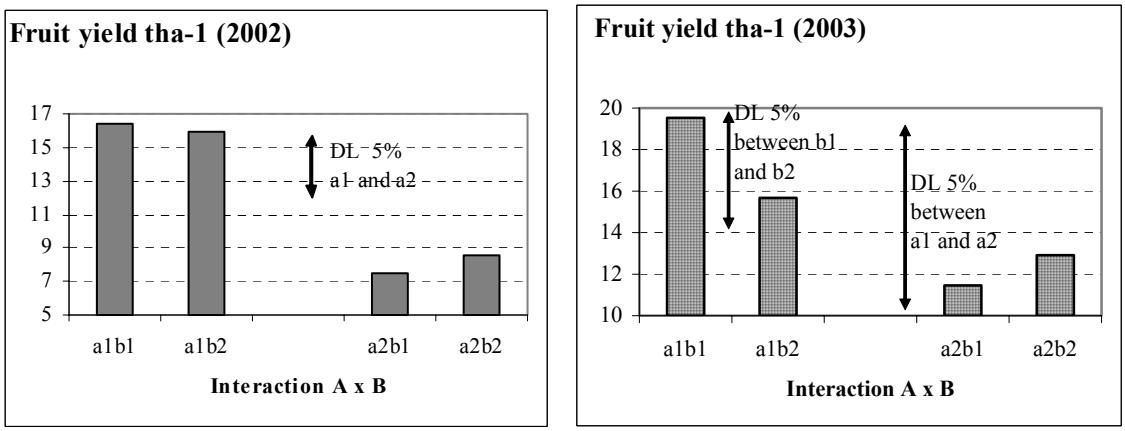

Fig. 9. The fruit production in studied variants grouped together in function of A x B interaction

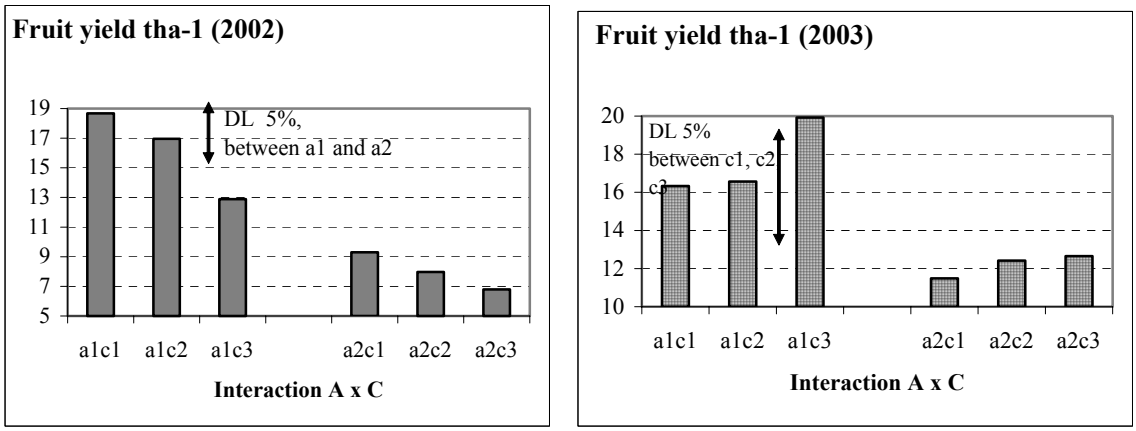

Fig. 10. The fruit production in studied variants grouped together in function of A x C interaction

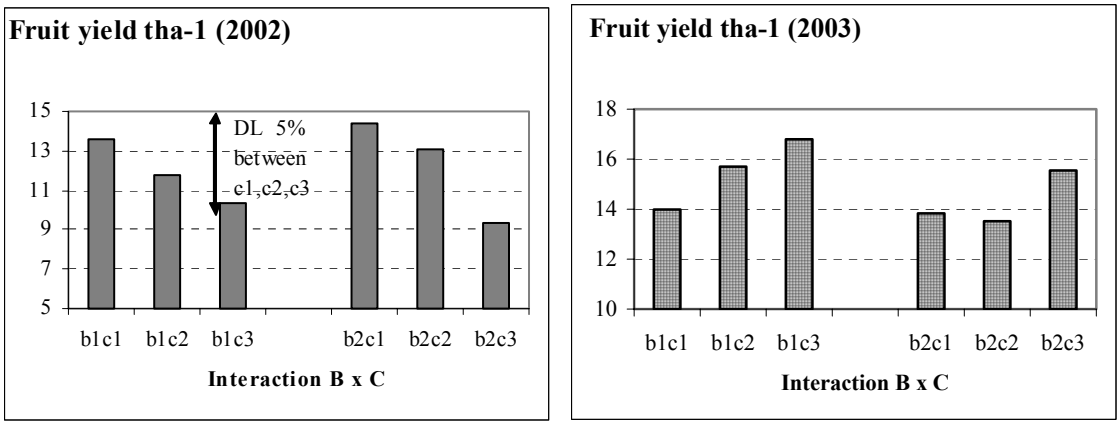

Fig. 11. The fruit production in studied variants grouped together in function of B x C interaction

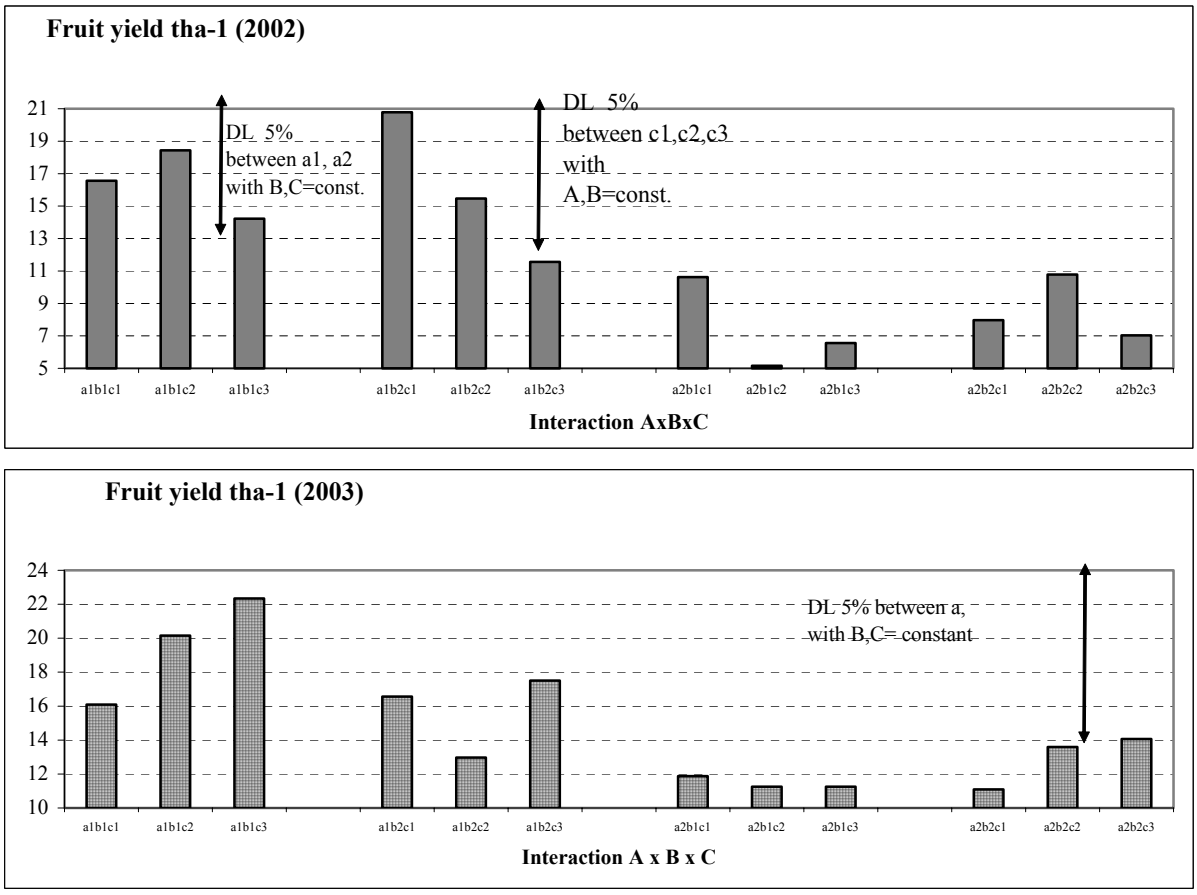

Fig. 12. The fruit production in function of A x B x C factors (2002, 2003)

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THE USE OF RECOMBINANT CLONES PPV/GFP (Green Fluorescent Protein)

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Key words: plum pox virus, green fluorescent protein, strains, recombinant clones

SUMMARY

To understand better the interaction mechanism between plant and pathogen, the key question is referring to the way of PPV (Plum pox virus) viral particle migration in host plant and where the plant immune system succeed to isolate these particles in the case of partial resistant and resistant genotypes. To offer a spatial view at tissues level of this interaction, it was used recombinant clones PPV/GFP (Plum pox virus/Green Fluorescent Protein). PPV viral particle was marked with GFP, and the observations were made through stereomicroscopy and confocal microscopy.

INTRODUCTION

Sharka disease (plum pox) is currently present in many countries in which the *Prunus* industry is economically important. *Plum pox virus* (PPV) is the causal agent of the disease initially described in Bulgaria (Atanasoff, 1932), which has spread to extensive areas worldwide (Roy & Smith, 1994; Cambra et al., 2006) mainly through infected propagation plant material. Transfer at a smaller scale has been occurring via a number of aphid species which spread the virus from infected sources to susceptible *Prunus* species.

Numerous PPV isolates were described as having different biological and epidemiological characteristics, such as those related to aggressiveness (Quiot et al., 1995), aphid transmissibility (Deborré et al., 1995) and symptomatology. Today, it is possible to classify viral isolates based on their serological behaviour, but for years it remained difficult to establish well founded clusters of PPV types or strains. Nowadays, reliable serological methods and reagents (well characterized antibodies) are available for both accurate detection and characterization of PPV, but intense research efforts have had to be made to reach this point.

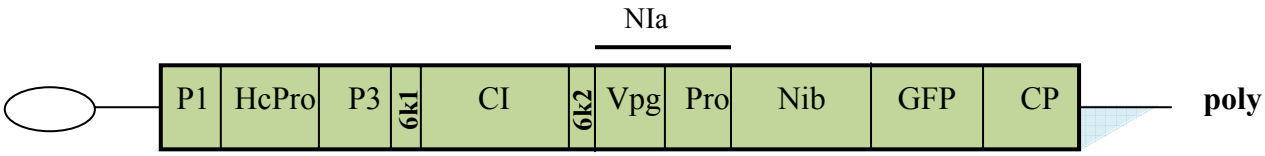
MATERIALS AND METHODS

The plant material that they have used was: apricots – Moniqui and Screara as the susceptible genotype, Goldrich, Henderson, Harlayne, Harcot and Stark Early Orange (SEO) as partially resistant genotypes.

The virus material consisted on PPV isolate – M20 (M strain)

In the viral particle segment between the Nib protein and Cp was inserted the GFP protein (fig. 1) which can be visualized through fluorescence stereomicroscopy, letting in vegetative tissue a green fluorescent trace which permits us the viral identification and localization. The recombinant clones PPV/GFP was obtained and sent by Prof. J.A. Garcia (Spain).

Fig. 1 – GFP- Tagged PPV (J.A. Garcia, CNB-CSIC, Madrid) Isolate DC (D strain)



The different apricot genotypes were grafted on GF 305 rootstock, rootstock which later was inoculated with PPV Marcus (M) strain marked with GFP. (Fig. 2)

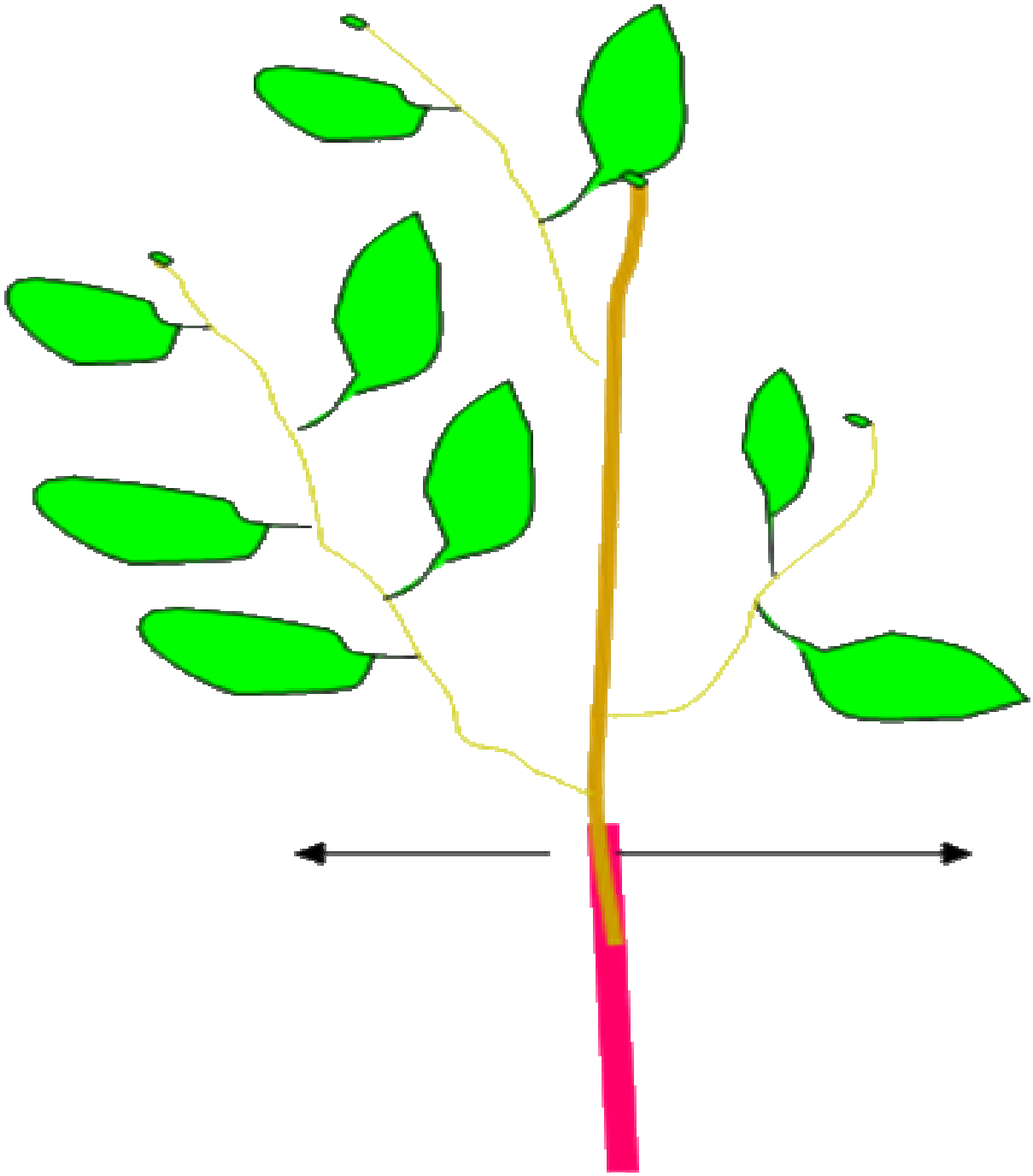


Fig. 2 – Inoculated GF 305 by PPV-M

RESULTS AND DISCUSSIONS

Fluorescence stereomicroscop **Confocal microscopy**

The Moniqui variety considered as a sensitive variety presents a homogeneous infection at veins and leaves level, while for the Screara variety, considered also as sensitive variety, the viral infection is localized around the veins. (Fig. 3 and Fig. 4)

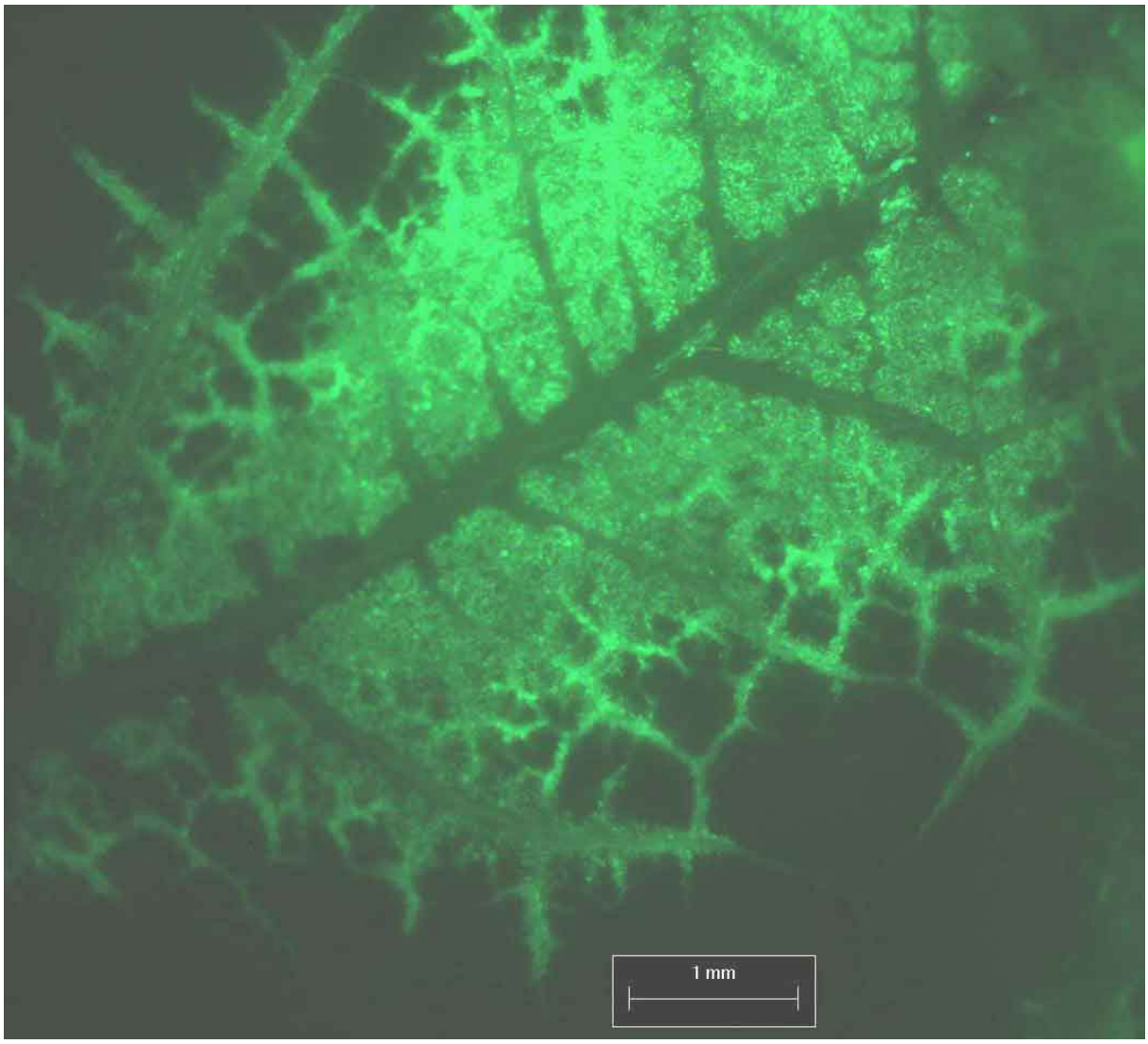


Fig. 3 – Fluorescence stereomicroscopy – Detection of GFP-Tagged PPV (De) in susceptible Moniqui

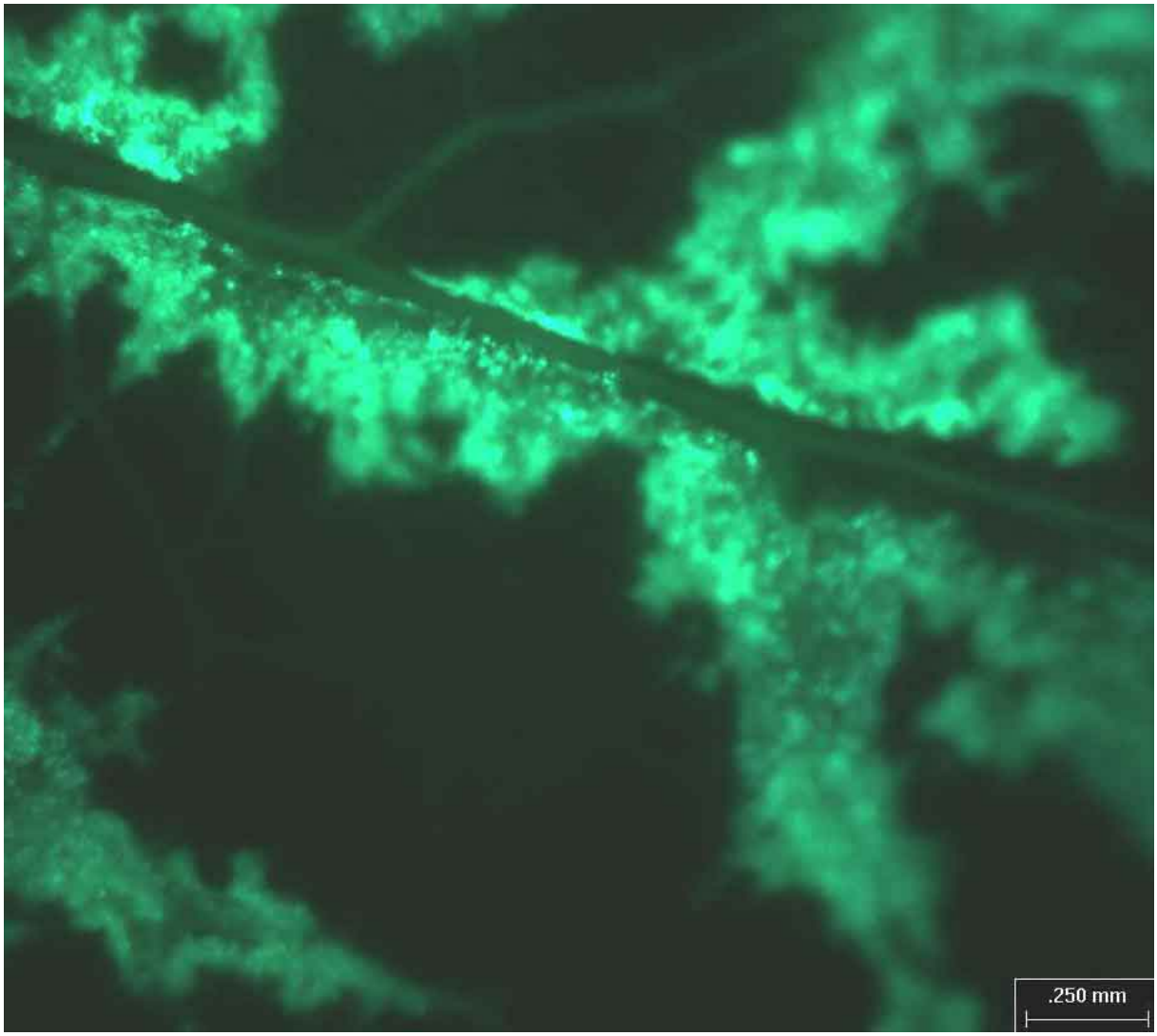


Fig. 4 – Susceptible Screara infected with GFP-PPV (Dc)

For the partial resistant cultivars (Henderson and Harlayne) it was observed isolation by the plant immune system of the viral particles as isolated spots. (Fig. 5)

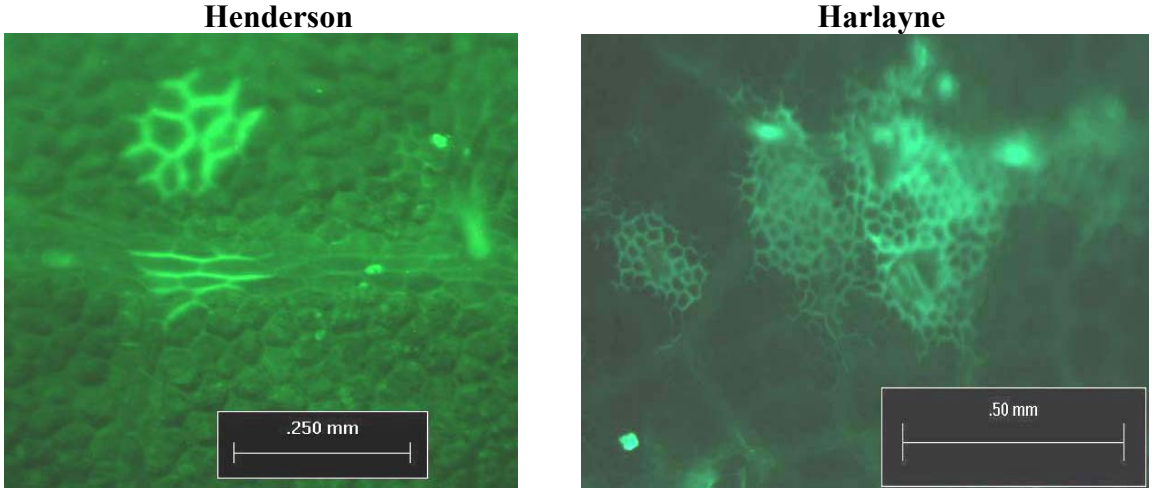


Fig. 5 – GFP tagged PPV in Apricot partially resistant cultivars: By Fluorescence Stereomicroscopy

The same response had the partial resistant genotypes (SEO and Harcot). (Fig. 6)

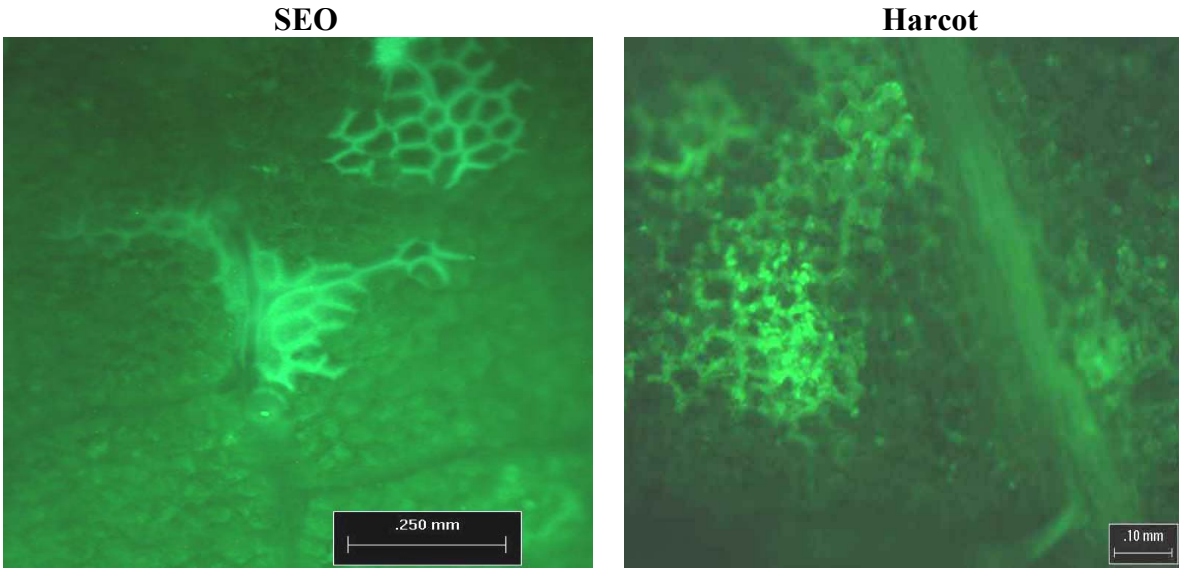


Fig. 6 – PPV is detected in resistant and partially resistant cultivars

CONCLUSIONS AND RECOMMENDATIONS

In the partially resistant apricot genotypes PPV is restricted in the parenchyma and medulla and in the case of the susceptible apricot genotypes the PPV systemic infection was observed especially in the parenchyma and in veins.

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IN VIVO VALIDATION OF IMMUNOGOLD DETECTION TECHNIQUE

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Key words: Plum pox virus, immunogold technique, sense, antisense

SUMMARY

Gold staining of the viral capsid (Cp) permits us to give an answer regarding its localization at veins level there, where *in-situ* hybridization technique and GFP technique (Green Fluorescent Protein) can not give an answer. The viral capsid through gold staining is observed at xylem level. Because, through *in situ* hybridization it was underlined only the presence of the viral RNA and through GFP technique we had a spatial view at leaf level, **Immunogold** technique offers us the detection of PPV at veins levels in such a way to have an idea about capsid, RNA, virus concept.

INTRODUCTION

Sharka disease, caused by *Plum pox virus* (PPV, potyvirus), is a major concern in *Prunus* species within the European regions and the Mediterranean area. At this time, no efficient methods are available to protect the orchard from contamination except the removal of diseased trees. The apricot and peach production is tremendously affected by the disease because fruits are damaged and improper for the market. A long term solution exists through the introgression of genetic resistance into new cultivars (Guillet-Bellenger and Audergon, 2001). In this case, it appears that the virus is not able to proceed through some steps of its infectious cycle leading to undetectable systemic infection.

In plants, cell-to-cell communication and molecular trafficking are largely dependent on cytoplasmic bridges between plant cells, the plasmodesmata (Nomo-Womdin et al., 1993). Several lines of evidence suggest that the movement of viruses is an active process mediated by virus encoded movement proteins (Hull 1991, Maule 1991). The functional nature and evolutionary origin of movement proteins in different virus groups may be distinct (Citovsky and Zambryski, 1991; Deon et al., 1992) although it is generally believed that movement proteins interact with host proteins and structures to facilitate passage of infection entities through the plasmodesmata (Fujiawara et al., 1993, Lucas et al., 1993; Noueiry et al., 1994; Waigman et al., 1994; Wolf et al., 1989).

When the spreading viral particles are reaching the vascular system, they enter it and are systemically transported through the plant. It is the systemic movement of the virus through the host vasculature, indeed, that is responsible for maximal viral accumulation and development of disease symptoms. Disruption in any step of the local or long-Proc. XIXth IS on Fruit Tree Virus Diseases distance movement of the virus would lead to an arrest in the virus infectious cycle and to a certain degree of host resistance. Therefore, we utilized the in situ hybridization technique in order to describe and compare the early steps of PPV infection in three different apricot cultivar, one susceptible and two partially resistant.

MATERIAL AND METHODS

The experimental material consists of one susceptible and two partially resistant apricot cultivars, 'Moniqui', 'Stella' and 'Stark Early Orange'(SEO) respectively. Two months-old apricot scions were inoculated by chip-budding with an M strain. Control plants were mock-inoculated in the same way.

Thick young stems (0.5 to 1 mm) were sampled at one, 5, 10, 20 and 30 days after inoculation and dissected in order to remove the infected graft. Samples were then fixed in 3.7% formaldehyde; 5% acid acetic; and 50% ethanol, placed under vacuum for 15 min and incubated in the above fixative for 45 min. This step was repeated twice before dehydration in ethanol.

The sense (negative control) and antisense dioxigenin-labelled riboprobes (RNA probes) were generated by cloning first of the PPV CP gene in a pSPORT plasmid (sense probe) or in a modified pBS-Kanamycin resistant vector (antisense probe).

Sense and antisense probes were then produced by run off transcription using, in both cases, the T7 RNA polymerase.

For Immunogold-silver staining technique, the plant material (1-3 months after bud breaking) was tested for virion particles accumulation by immunodetection on cross sections. Paraplast was slowly deposited around each section, on the slides and reagents were applied over. To avoid non-specific binding of antiserum, sections were incubated for 30 min at room temperature in PBS buffer completed with 1% (v/v) Tween 20, 1% (p/v) BSA, 2% (p/v) PVP40. They were then incubated for 1 hour with anti-PPV IgG diluted 1:200 in the same buffer. After washing, 10 nm Goat anti-rabbit gold conjugate (GAR-gold, Sigma) was applied for 1 hour on slides at 1:20 dilution in PBS-BSA-PVP buffer. Excess of gold conjugate was eliminated by washing the slides in the same buffer. A final washing step was performed in distilled water. Enhancement of antigen-antibody-gold complexes was achieved by applying one drop of initiator and one drop of enhancer together (Silver enhancing Kit, BBInternational, TEBU Bio), for 10 min in the dark. Slides were rinsed with water and air-dried. Sections were finally stained with 2% gentian violet in water and examined by optical light microscopy (Kundu, 1999)

RESULTS AND DISCUSSIONS

In the GF 305 tigers transversal section we can observe the viral capsid signal at parenchyma level (Fig. 1).

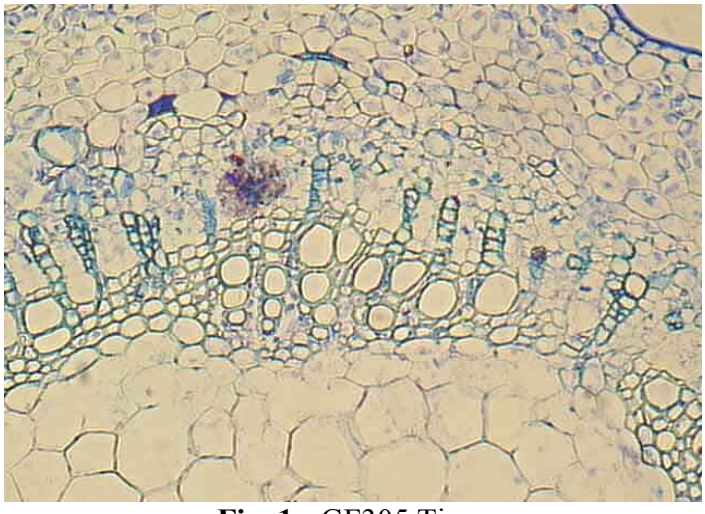

Fig. 1 - GF305 Tiges

In the case of Moniqui, the apricot sensitive variety, the signal of the viral capsid can be observed at phloem level through longitudinal section as in Fig. 2. But through *in situ* hybridization we don't detect the RNA signal at veins level, only in the parenchyma and medulla. So, through the immunogold technique we get the wanted answer.

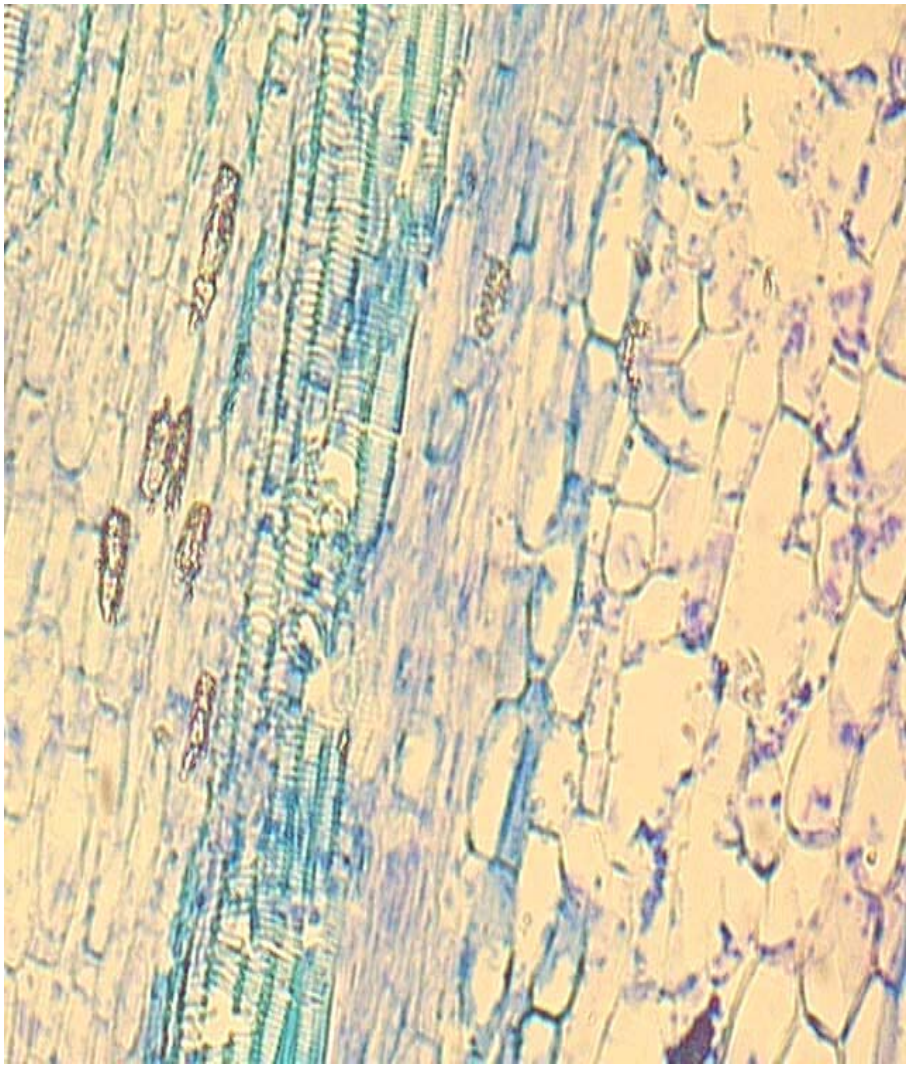

Fig. 2 – Apricot sensitive variety

For the partially resistant varieties (SEO and Stella) the signal of viral capsid was underlined also at parenchyma and epidermis level. (Fig.3 and Fig.4)

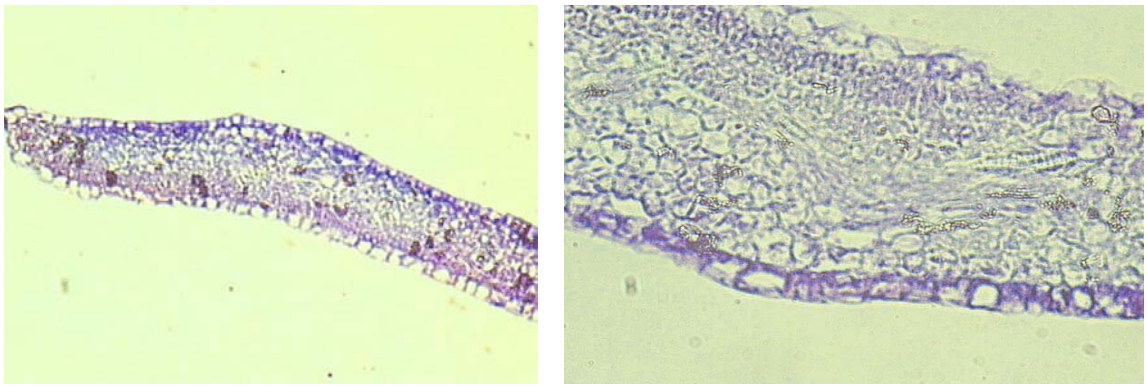

Fig. 3 – SEO partially resistant variety

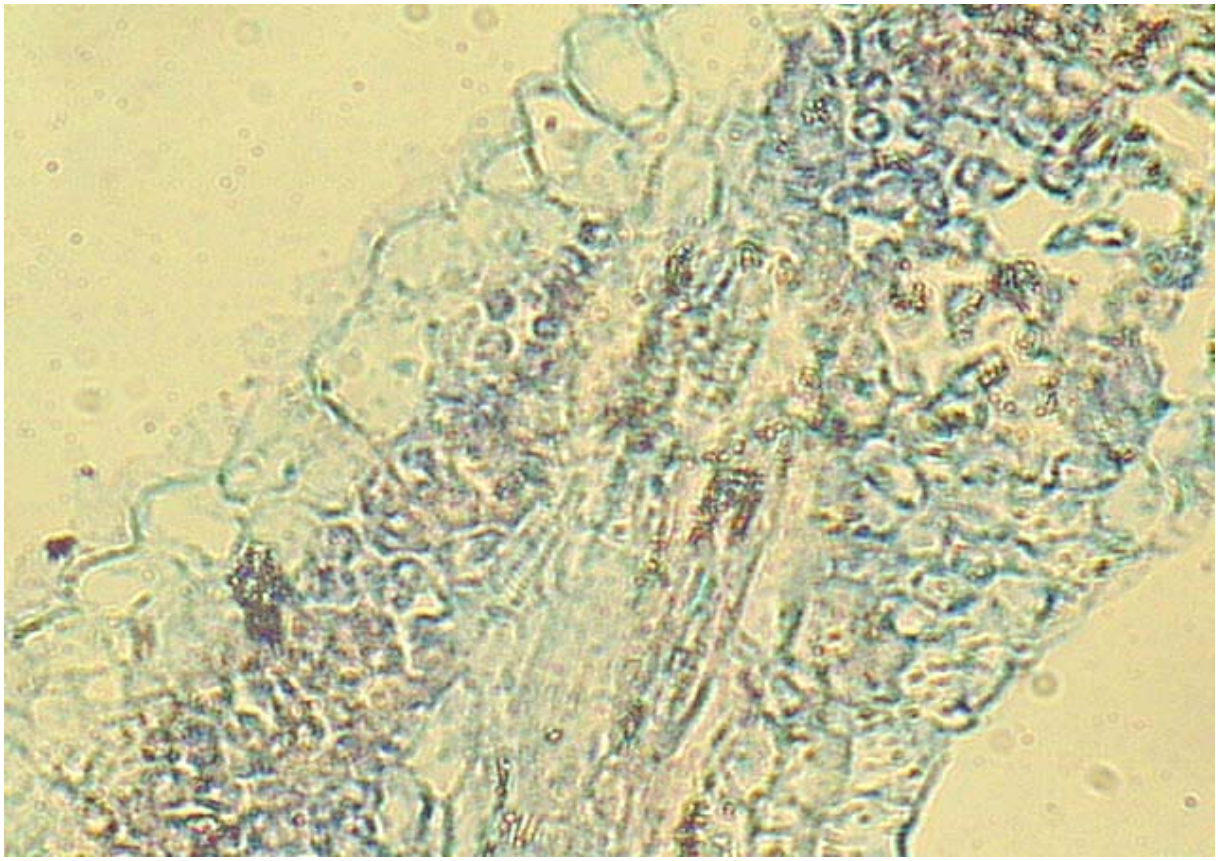

Fig. 4 – Stella partial resistant genotype

CONCLUSIONS AND RECOMMENDATIONS

Through Immunogold technique we could obtain a complete image of the PPV viral particles way of migration in host plant. Also we could better understand the concept of the viral infection. Because we could identify the viral capsid signal only at phloem level we can underline the fact that the virus source is not the brute sieve.

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THE SELECTIONS OF COMPACT-COLUMNAR APPLE HYBRIDS

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APOSTOL Dragoş, ATUDOSIE Nicole, LIGIA Ion

ABSTRACT

The researches have been sustained in orchard of apple's compact-columnar hybrids establish in 1999 at S.C. Frasinu S.A. Buzau. There were used the hybrids: H21-5/2, H35-5/7, H38-5/9, H61-6/1, H61-6/5 and H73-6/4, obtained in the field of Fruit Growing Department from U.S.A.M.V. Bucharest. The hybrids were grafted on MM 106 rootstock and planted at the distance de 4/1.2 m (2083 trees/ha). The main purpose of the researches was based on growth and fructification observations during selection process. From analysing and performing obtaining result 2 groups of vigour: columnar compact smaller hybrids (H21-5/2 and H35-5/7) and columnar compact taller hybrids (H61-6/5 and H73-6/4). The fructification potential of these hybrids was between 5.93-43.93 tons/ha, realised on harvesting during the period 2001-2006.

INTRODUCTION

The compact-columnar apple it's a new "ideotip", with a principal stalk and 3-4 secondary branches which grow vertically and parallel, forming a permanent structure with dens fruiting spurs. The trees grafted on MM 106 rootstock were planted at density of 1250-2083 trees/ha. Developing the secondary branches the plants have a better extensive compact-columnar crown and are obtaining an economical early crop. On contrary, comparing with the columnar apple, planting expenses are reducing (smaller plant density) and number of the chemical treatment, because all these selected hybrids had a better resistance at *Venturia inaequalis*.

MATERIALS AND METHODS

The researches have been sustained in a orchard established in 1999, in the experimental field S.C. Frasinu S.A. Buzau. There were studied the hybrids: H21-5/2, H35–5/7, H38-5/9, H61-6/1, H61-6/5 and H73-6/4, grafted on MM106 rootstock. During the years of researches the soil was maintain as tillage, the fertilization was made with manure once a 2 years (40 t/ha) and the irrigation was made every year, 4-5 times/year, assuring best growth and fructification conditions. The increased disease resistance of these hybrids reduced number of the chemical treatments at 7-8/year.

The main objectives of our researches were the following: the growth parameters, the fructification type and the fruit setting potential. For this purpose, every year were made biometrical observations and measurements regarding the growth and fruit setting characteristic of every hybrid.

RESULTS AND DISCUSSIONS

After 6 years of studies and observations was noticed a big variability of the hybrids regarding: tree height, trunk thickness, ramifications capacity and the differentiation of fruit buds. From table 1 is observed that there are 2 kinds of hybrids, namely: 1. hybrids with smaller compact-columnar crown as type "spur", with the fruits resemblance as size and colour with the cultivar Golden delicious (H21-5/2 and H35-5/7); 2. hybrids with middle

sized compact-columnar crown, with mixed fructification type, with medium sized, red-pink fruits (H38-5/9, H61-6/1, H61-6/5 and H73-6/4).

Analysing the early crop and fruit setting potential of these hybrids (table 2) is obvious that some of them had a reduced fructification (H21-5/2 and H35-5/7) 17.25-17.92 kg/tree (average on 6 years) and others a better fructification (H38-5/9, H61-6/1, H61-6/5 and H73-6/4) between 19.45 and 21.09 kg/tree. Average fruit production on all the rootstock increase continuous from 5.90 kg fruits/tree (2001) till 34.47 kg fruits/tree (2006).

Average fruit production/ha during the years 2001-2006 (table 3) had values between 35.93 tons/ha (H21-5/2) and 43.93 tons/ha (H73-6/4). Average fruit production for all apple hybrids during this period was of 40.32 tons/ha.

CONCLUSIONS

Studies and researches regarding parameters analysing (the trees height, trunk diameter, number of the branches from the permanent structure and fructification type) had the following conclusions:

1. after 9 years from the planting, were observed 2 types of hybrids;
2. the height of the trees show that the growth rhythm was smaller to the hybrids: H21-5/2 and H35-5/7 and bigger at H61-6/5 and H73-6/4 ;
3. the trunk thickness had a positive correlation with the growth height vigour of the tree;
4. a better ramification was observed at the hybrid H73-6/4 ;
5. in the crown structure, “spur” were dominated at all the hybrids ;
6. at the hybrids H21-5/2 and H35-5/7 the number of twigs and scions was smaller, comparing with the hybrids H61-6/5 and H73-6/4.

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Table 1

The permanent structure of some compact-columnar apple crown, 9 years old

Parameters analysing	H21-5-2	H35-5-7	H38-5-9	H61-6-1	H61-6-5	H73-6-4
Height (m)	2.45	2.36	2.78	3.01	3.42	3.26
Trunk diameter (cm^2)	38.21	37.50	38.42	40.10	43.50	48.32
I degree branches	21	18	16	15	21	23
II degree branches	53	51	43	58	63	71
Twigs	8	6	14	19	25	28
Scions	6	10	16	21	28	15
Prickles	183	214	160	172	138	129
Spurs	68	75	110	135	68	73

Table 2

Fruit production obtained on trees (kg) registered in the period 2001-2006 (3-8 years from the planting)

Year of production	H21-5-2	H35-5-7	H38-5-9	H61-6-1	H61-6-5	H73-6-4	Annual fruit production (kg/tree)
2001	6.10	7.10	3.10	4.75	6.25	8.10	5.90
2002	8.70	9.46	10.60	8.30	9.15	11.60	9.64
2003	13.10	16.30	15.81	15.20	13.20	18.10	15.29
2004	23.40	18.21	21.40	21.35	19.36	25.15	21.48
2005	26.15	25.10	29.41	30.10	28.30	30.50	28.26
2006	28.30	31.40	36.40	41.20	36.40	33.10	34.47
Average	17.25	17.92	19.45	20.15	20.30	21.09	19.36
Variations limits	6.10-28.30	7.10-31.40	3.10-36.40	4.75-41.20	6.25-36.40	8.10-33.10	5.90-34-47

Table 3

Express of fructification potential at the compact-columnar hybrids during the years 2001-2006

Hybrid	Average fruit production 2001-2006 (kg/tree)	Planting density (tree/ha)	Average fruit production (t/ha) during the years 2001-2006
H25-5/2	**17.25**	**2083**	**35.93**
H35–5/7	**17.92**	**2083**	**37.32**
H38-5/9	**19.45**	**2083**	**40.51**
H61-6/1	**20.15**	**2083**	**41.97**
H61-6/5	**20.70**	**2083**	**42.28**
H73-6/4	**21.09**	**2083**	**43.93**
Average	**19.36**	**2083**	**40.32**

Fig. 1 - H 61-6/1

Fig. 2 - H 21-6/1

Lucrări ştiinţifice U.S.A.M.V.B., Seria B, Vol. L, 2007

RESULTS REGARDING *IN VITRO* PROPAGATION FOR TWO STRAWBERRY CULTIVARS WITH CONTINUOS FRUITING

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Keywords: in vitro culture, explant, micropropagtion, ratio of multiplication

ABSTRACT

The strawberry cultivars with continuous fruiting, Elsinore and Evi, had a good behaviour in the initiation phase and micropropagation of *in vitro* culture. Nutrient media used was Lee-Fossard (1977) supplemented with growing regulators in function of the in vitro phase.
Decreasing the photoperiod from 16 to 12 hours doesn't have significant influence for the growing of explants and ratio of multiplication but this aspect determinate the elongation and etiolating of them.

INTRODUCTION

The strawberry cultivars with continues fruiting are few know and cultivated in our country. The main explication of this aspect is due the lake of consumer's education regarding the consumption in the outside of season of these fruits. Due the difficulty of multiplication of strawberry is necessary to elaborate o biotechnology of these cultivars.

Our research had the goal the elaborate the biotechnology *in vitro* for strawberry cultivars with continuous fruiting, Elsinore and Evi.

MATERIALS AND METHODS

For initiation into *in vitro* stage we used as a biologic material the explants prelevated from the strawberry cultivars with continuous fruiting. The used cultivars were represented by the Elsinore (fig. 1) and Evi (fig. 2). Elsinore cultivar is characterized by medium vigour, intense green colour of leaves, big productivity with continuous flowering from May to November. Evi cultivar has a bigger vigour, bigger fruit with spheric form and more intensively red colour of fruit. The quality of both cultivars is higher.

Young strawberry cultivars unrooting were disinfection by keeping 4 minutes in etilic alcohol 94% and 10 minutes in calcium hypochlorite 6 %, then the material was washed with distillate water sterilized by autoclaving.

The prelevation of the explants from the meristems was made under binocular magnifying glass, in sterile conditions under laminar flow hood (fig. 3).

The tools (pincers, knifes) were sterilized in etuve at 120^0C for 2 hours.

Nutrient media solidified and tested for initiation stage and micropropagation had a different composition from point of view of phytohormons.

Before the placing in the culture vessel the pH of the nutrient media was adjusted at 5,6-5,8.

Nutrient media was sterilized by autoclaving at one atmosphere (121^0C, 20 minutes). The growing condition was 22-24^0C, 12 and 16 hours photoperiod and 3500 lux intensity of light (fig. 4).

During the studies was registered the following data: percent of growing explant, ratio of multiplication, the presences of the callus and vitrification phenomena.

RESULTS AND DISCUSSIONS

The observations the registered data during the experiment demonstrated the influence of abiotic (the composition of nutrient media, photoperiod) and biotic (genotype) factors on the growing and multiplication explants.

In the initiation stage, on the constant level of the nutrient media composition and photoperiod registered different percent of growing explants, in function of cultivars. In this phase, the best behaviour had Elsinore cultivar with 75-98% growing explants while Evi cultivar registered 69-91% growing explants (fig. 5).

Regarding the influence of nutrient media composition we observed the fact that the higher values was registered in the variant number 2, under the influence of 0,2 mg/l indolacetic acid and 0,1mg/l kinetin. In this sense Elsinore cultivar registered 93-98% growing explants and Evi cultivar registered 88-91% growing explants. At 0,5 mg/l concentration of kinetin, the growing of explants registered the smaller values while the increasing of kinetin at 1,5 mg/l determined the presence of callus and the reduced of the percent of growing explants (fig. 7).

Regarding the influence of photoperiod the best results was determined for 16 hours.

The ratio of multiplication of the strawberry cultivars studied with continuous fruiting had influenced by the genotype, kinetin concentration and photoperiod. Elsinore cultivar registered a bigger ratio of multiplication than Evi cultivar at all the variant of kinetin used and photoperiod. The maximum value achieved at Elsinore cultivar was 31-38 microshoot/explant. Evi cultivar registered 29-34 microshoot/explant but these was better development than Elsinore (fig. 6).

Regarding the concentration of kinetin we see the fact that at increasing the concentration of BAP from 0,2 to 0,6 mg/l, the ratio of multiplication increasing. Although the bigger value of multiplication ratio achieved at 0,6 mg/l BAP, the reduced size of mycroshoot and the presence of vitrification phenomena, we consider the best efficiency is in the variant with 0,4 mg/l kinetin.

Decreasing the photoperiod at 12 hours don't produce the significant differences (fig.7).

The results achieved at 16 hours photoperiod are comparable with the results achieved for the other authors (Lee and Foosard, 1977; Coman and Neculae, 1981) which working with another cultivars used an optimal rapport of auxin and kinetin with 0,2mg/l indolacetic acid and 0,4 mg/l BAP for multiplication *in vitro.*

The possibility to reduce the photoperiod without significant difference of the growing explant has the same aspect like in case of other strawberry cultivars and horticulture specie (Teodorescu and Neculae, 1994; 1998).

CONCLUSIONS

The cultivars studied with continuous fruiting, Elsinore and Evi, have a good behavior in the initiation and multiplication stage of in vitro culture.

In the initiation stage of in vitro culture, the growing of explant have made on nutrient media Lee and Fossard (1977) supplemented with 0,2 mg /l indolacetic acid and 1,0 mg/l kinetin.

The ratio of multiplication is efficiency when kinetin concentration is unplaced with 0,4 mg/l BAP.

Reducing the photoperiod from 16 to 12 hours doesn’t produce the significant differences.

Microshoot achieved will be used for testing the capacity of rooting and acclimatization, to elaborate the *in vitro* biotechnology for both cultivars.

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Table 1. Nutritive media composition for initiation stage and *in vitro* multiplication for strawberry with continuous fruiting

Components (mg/l)	**Initiation stage**			***In vitro* multiplication**		
	V.1	**V.2**	**V.3**	**V.1**	**V.2**	**V.3**
Macroelements	LF[1]	LF	LF	LF	LF	LF
Microelements	LF	LF	LF	LF	LF	LF
Vitamins	LF	LF	LF	LF	LF	LF
Indolileacetic acid	0,2	0,2	0,2	0,2	0,2	0,2
Kinetin	0,5	1,0	1,5	-	-	-
BAP mg/l	-	-	-	0,2	0,4	0,6
NaFeEDTA	32,0	32,0	32,0	32,0	32,0	32,0
Glucose g/l	40,0	40,0	40,0	40,0	40,0	40,0
Agar g/l	7,0	7,0	7,0	7,0	7,0	7,0

[1] Legend: LF = Lee – Fossard (1977)

Fig. 1. Elsinore cultivar

Fig. 2. Evi cultivar

Fig. 3. Laminar flow hood

Fig. 4. Aspect from growing rooms

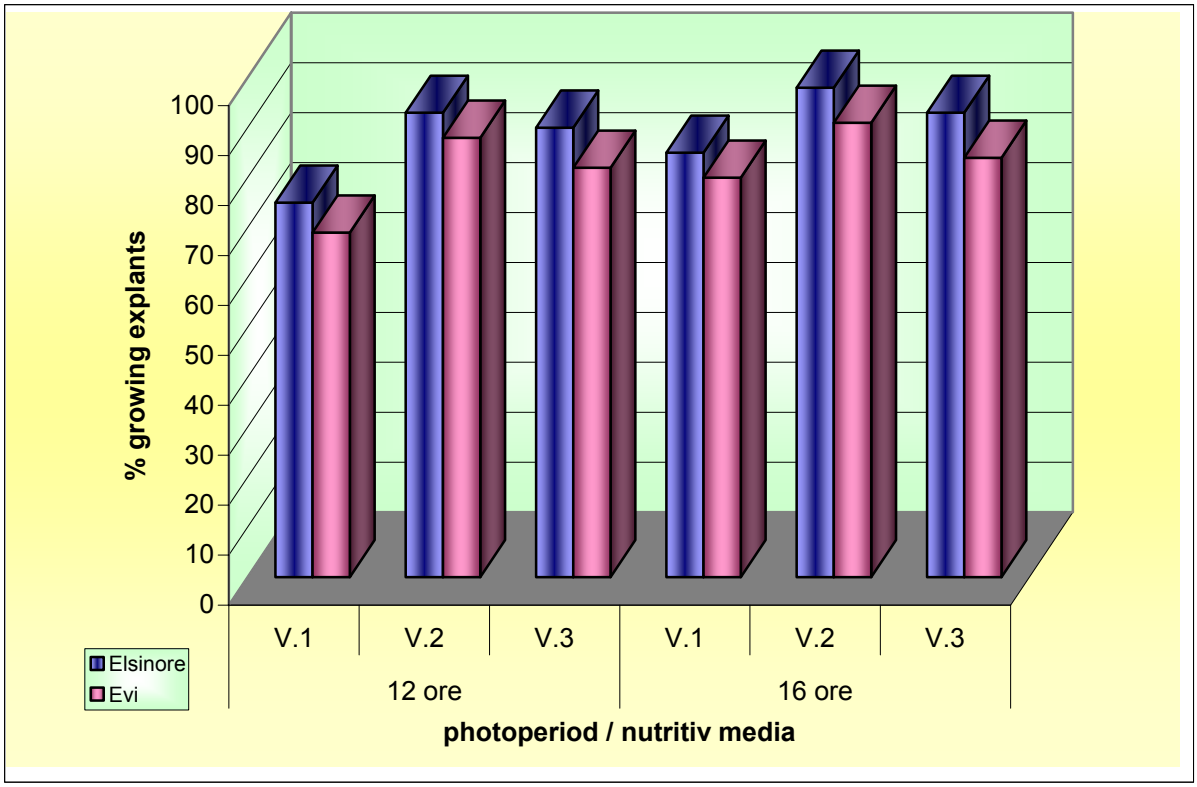

Fig. 5. The cultivars behaviour in the initiation stage

Fig. 6. Aspect from multiplication stage of Evi cultivar

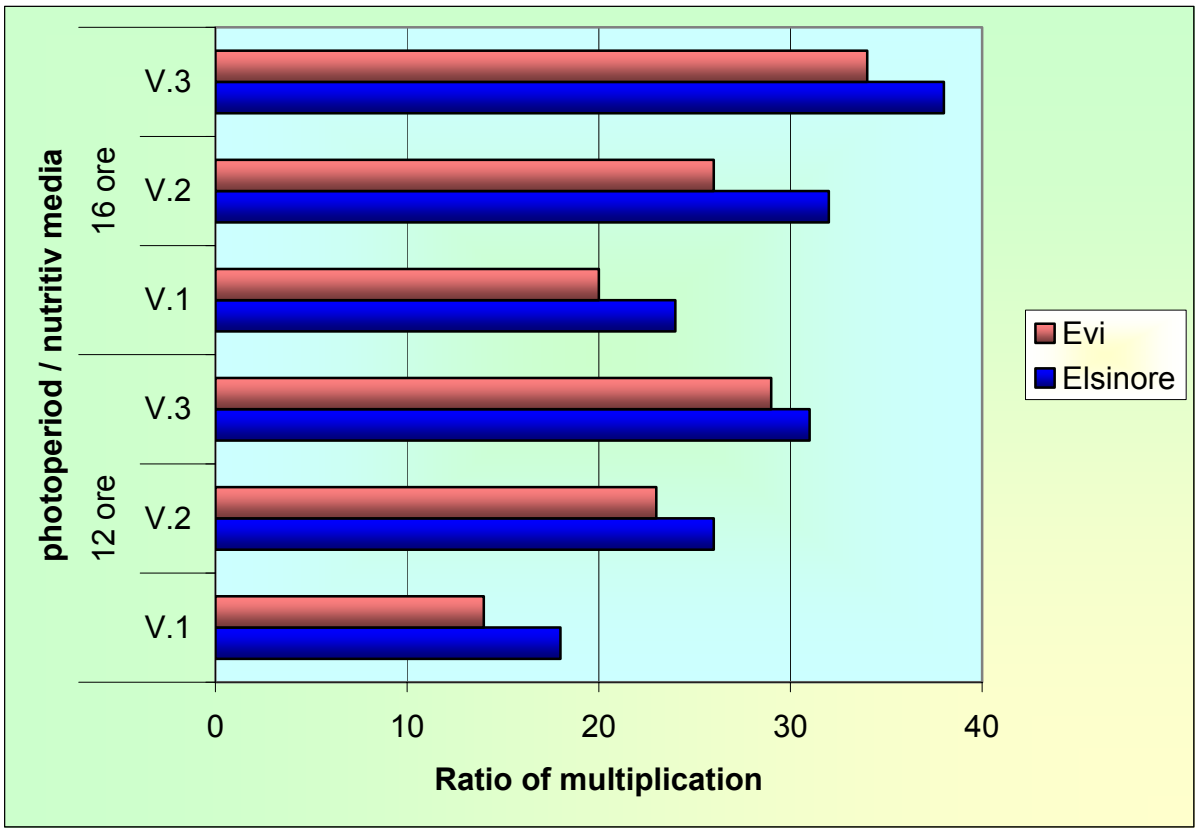

Fig. 7. *In vitro* multiplication for Elsinore and Evi cultivars

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THE QUALITY OF POMEGRANATE (*PUNICA GRANATUM*) HARDWOOD CUTTINGS ROOTED IN DIFFERENT SUBSTRATES

PETICILĂ A.G.

Keywords: Pomegranate, hardwood cuttings, substrates.

OBJECTIVES

- For this was *effectuated* study of the substratum temperature effect on callous and root formation and study of some *pomegranate* variety's behaviour on rooting process.
- Choosing the optimal substratum for pomegranate (Punica granatum) cutting propagation and establishment of the optimal moment for cutting.

INTRODUCTION

Punica granatum is a species whose origin is in Asia. It was cultivated in Mediterranean regions, in Africa and Europe, were it was signalised in the same crop area around 2000 years ago. The most important yield and area production are in Egypt, China, Iraq, Iran, Afghanistan, Pakistan, India, Saudi Arabia, and Turkey. This beautiful plant has the old name of Tunis, Puny, and it is the symbol of luck in Greece. It was brought in the Californian region by the Spanish colonists.

The plant grows like a bush witch gets around 2-3 meters, in wild reaching even 7 meters. The raciness is strong, the leaves are small, elliptic and dark green coloured at the superior surface. The flowers are growing in the top of the branches, solitaires or in groups. They are hermaphrodites, red, pink and orange coloured. There are also varieties that have flowers with more petals then usual ones. Those ones are used more like ornamental plants. The fruit is a berry weighting around 200-800 grams, being yellow brown coloured at the maturity. The most interesting varieties the ones having sweet pulp and soft seeds. The most important group is named *Mollar* and another interesting one is *Valencianas*.

MATERIALS AND METHODS

In the present trial hardwood cuttings, 10-15 cm length, were used.

Biological material: pomegranate local plant, unknown origin**.**

Cutting's period: -15 November 2006

-15 February 2007

Hormonal treatment: 1000 ppm of IBA (3-indolilbutiric acid), 1000-15000 ppm IBA+AAN for 10 seconds.

Substratum types (experimental variants):

V1 - pearlite

V2 - sand

V3 - pearlite + sand

Temperature: - at cutting's base: 22-25° C, in the air: 15-18° C

Cutting plant: Rooting bench type U.S.A.B. Close circuit thermostat.

RESULTS AND DISCUSSION

On V1 variant (pearlite) the highest rooting percentage was obtained by plant cutter in first period (November) (table 1). On this substratum, hardwoods cuttings formed also the longest roots (8.1 cm). The diameter of roots per cutting had 6.9 cm (table 3).

- On V2 variant (sand) the rooting percentage has values between 48.8 and 68.7% in November and 50,1to 68,7 % in febr (table 2). The pomegranate has the longest roots (7.13 cm), and the root's diameter per cutting was 8.2 in sand variant.
- On V3 variant (pearlite and sand) the percentage of rooting varied from 45.0 to 95.2% in November and 46,1 to 86.9 % in February. On V3 also the root length was height 8.4 cm.
-High rooting percentage 95,2%, was registered when the cutting is make in November varieties formed the highest root length per cuttings (8.9) even the root's diameter was lower.

CONCLUSIONS

During the trial the pomegranate plants had the highest rooting percentage. The optimal period for cutting was between the end of November. Basal heating at 22-24° C and lower atmospheric temperature (15-18° C) were essential for obtaining a high rooting percentage. The best results were obtained when pearlite + sand (V3) and pearlite (V1) were used. The best treatment is witch IBA 1000 ppm, 10 seconds, following the IBA +ANA 1000 ppm. Between the root's length and root's number per cutting an indirect relation was found.

Table 1

Rooting percentage (%) of pomegranate hardwood cuttings 15 nov. 2006

Substratum	Pearlite	Sand	Sand+Pearlite
IBA 1000 ppm	87.5	68.7	95.2
IBA+ANA 1000ppm	85.5	68.4	81.2
IBA+ANA 1500 ppm	75.0	58.4	75.0
MARTOR	48.7	48.8	45.0

Table 2

Rooting percentage (%) of pomegranate hardwood cuttings 15 fevr. 2007

Substratum	Pearlite Varieties	Sand Varieties	Sand+Pearlite Varieties
IBA 1000 ppm	81.25	68.7	86.9
IBA+ANA 1000ppm	75	62.5	71.5
IBA+ANA 1500 ppm	68.7	56.2	63.8
MARTOR	48.7	50.1	46.1

Table 3

Root's characteristics at the end of the rooting period

Species	Pearlite		Sand		Pearlite+Sand	
	Φ root cm	L root cm	Φ root cm	L root cm	Φ root cm	L root cm
Punica granatum	6.19	8.1	7,13	8,2	4.6	8,9

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APPLE BREEDS OBTAINED BY INDUCED MUTAGENESIS, HOMOLOGATED IN THE PERIOD 2004-2007

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Keywords: apllesorts, genetically resistance at disease, inducted mutagenesis, gamma and x radiations.

ABSTRACT

The researches effectuated at the Research and Development Station for fruit (tree) growing Voineşti, with the use of some physical mutagen factors (game radiations, X rays) on the biological material formed for pollen and seeds apple in repose or after maturity hade been materialized with a lot of sorts and apple picks and flowers with genetically resistance at disease, with a lot of economic value.
Redix sort (synonym 3/73-83 V) obtained from sexuate hybridization Goldenspur and Prima (irradiated pollen with 1000 R), homologated in 2004.
Iris sort (synonym 8/94-82 V), obtained from Prima and natural pollination with the irradiation of dry seeds in dose of 8000 R, homologated in 2005.
Irisem sort (synonym 2/1-90 V) obtained from Prima and natural pollination with the irradiation of after maturity seeds in dose of 5000 R, homologated in 2006.
Real sort (synonym 9/78-82 V), obtained from Prima and natural pollination with the irradiation of dry seeds in dose of 8000 R, homologated in 2007.

INTRODUCTION

In the genetic improvement, the priority objective is the creation of new breeds with superior features, under the aspect of productivity, resistance against diseases and pests, strength, fruit quality etc.

The improvement of the genetic resistance against some diseases is outlined as the principal objective in the improvement programs, having economical and ecological implications with an extraordinary impact on people's life V Cociu, 1999).

Both on national and on worldwide level, the methods used in the apple genetic improvement aim at the same purpose, the most used being the conventional methods, the inter- and the intra-specific hybridization and the selection of forms derived from the obtained hybrid seeds. Besides the classical improvement methods, also unconventional methods - like the induced mutagenesis - are used, which presents some specific aspects, being realized with the help of the radiations of some mutagenic physical agents (gamma or X radiations), used in different doses on the used biological material (seeds, pollen etc.)

In the efforts to induce genetic exchanges at the apple breeds by gamma radiations, Lacey and Campbell (1977) produced very productive mutations at the Brambley Seedling, and Fideghellii and Donini (1977) induced mutations by the ionizing irradiation method, changing the breed Anurca from a biannual productivity breed to one with annual fructification (Way, 1983), quoted by V Cociu (1999).

Using dry or post-matured seeds from the natural pollination of the Prima (Vf) breed, irradiated with gamma radiations in different doses, conditions were created for the variability increase of the obtained hybrid material and for a strong stability in maintaining the characteristics of the new breed (Valeria Petre, 1997).

The approached methods and the researches performed at the Voineşti Station, contributed to the increase of the genetic variability of the used biological material,

concretizing finally in obtaining and homologating of new genetic disease resistant apple breeds.

MATERIALS AND METHODS

Researches for obtaining of some genetic disease resistant apple breeds by mutagenesis were initiated at the Research and Development Station for Tree Growing Voineşti starting with the year 1982, irradiating biological material composed of pollen, apple seeds in repose and post–maturated status.

Dry apple seeds of the breed Prima (Vf) were irradiated in the year 1983 in doses of 6000 – 8000 – 10.000 R (gamma radiation) – and in the years 1989, 1990, 1991 and 1992 post–maturated seeds were irradiated in doses of 5000 R. In the year 1983, pollen of the breed Prima (Vf) was irradiated with medical devices at doses of 1000 – 2000 – 3000 R (X - rays).) Blossoms of the breed Goldenspur were pollenized with the pollen from the breed Prima (Vf).

The researches had in view the influence of different irradiation doses on the irradiated biological material, the most valuable elites being selected based on the growth strength, the traversing of the blossoming phenophases, the precocity, the productivity, the fruit quality and the behaviour regarding the attack of the principal diseases.

The selected apple elites, grafted on the M 106 graft support, were studied in contest mico cultures, with trees planted at the distance of 4x2 m (1250 trees/ha).

The soil on which the apple contest cultures are located is brown eumezobazic weakly pseudogleised, with clay texture, with a weak acid pH (5,7 – 5,9). The humus content is average at the surface (2,0 – 2,9%), medium supplied with nitrogen and weakly supplied with phosphorus and potassium.

The climatic conditions were favourable to the growth and the fruit bearing of the trees, characterized by an average yearly temperature greater with 3^0C, as compared to the zone's normal one ($8,8^0$C), with a sum of yearly rainfalls transcending the normal ones of 782 mm (in the year 2005, 1.113 mm were registered).

In the experimental field, the soil was maintained fallow on the intervals and clean of weeds on the tree rows. For the pest control, 6 – 8 treatments - only with insecticides - were applied. The other works were performed conforming to the technologies specific for the intensive apple orchards.

RESULTS AND DISCUSSIONS

The studied biological material - obtained following the irradiation of the dry or post-matured seeds, originated from the free pollenization of the Prima (Vf) breed, or from the hybrid combinations realized with irradiated pollen at one of the partners - permitted the putting into account of some valuable apple elites, with genetic disease resistance, obtained by induced mutagenesis.

The selected elites - and then the recently homologated breeds - contribute to the diversification of the genetic base and of the apple assortment, with beneficial influences on people's health protection and on the environment.

The breed Redix (sin. 3/73-83V), obtained by the sexuate hybridization Goldenspur x Prima (pollen irradiated with 1000 R), homologatet in the year 2004.

The tree has a medium strength, with an exposed stance, and a standard fructification. It is resistant to the attack of Venturia inaequalis and of Podosphaera leucotricha.

The production potential in the years 4-5 since plantation is 7-10 t/ha and 25-30 t/ha at the age of 8-10 years (1250 trees/ha). The fruit has 160 g., is a somwhat long cone frustrum, similar to the Starkrimson breed, with the skin coloured purplish-blue, a colour that fullfills

itself during keeping. The pulp becomes white-yelloish during keeping, juicy– acidulated, with a good taste. The harvesting maturity takes place at the end of September, and the optimal consumption period is until February – March.

The Iris breed (sin.8/94-82V), obtained from Prima x natural pollenation, with dry seeds irradation in doses of 8000R, homologated in the year 2005.

The tree has a medium – small strength and is very precocious and productive. It bears fruits on short branches (pricks), offshoots and twinges. It differentiates fruit bearing buds each year, regardless of the fruity quantity produced in the last year. It is resistant against the attack of Venturia inaequalis and it is weakly attacked by Podosphaera leucotricha.

The production potential at the age of 8-10 years is 35-40 t/ha (1250 trees/ha). The fruit has 150 g., is spherical, lightly flattened, with yeloow–greenish coloured skin, 2/3 of the surface being covered by carmine-red. The pulp is white–yellowish, juicy and sweet acidulated, with a good taste. The harvesting maturity takes place at the middle of September and the consumption periods extends itself until the end of November.

The Irisem breeds (sin.2/1-90V), obtained from Prima x natural pollenation, with dry seeds irradiation in doses of 5000 R, homologated in the year 2006.

The tree has a small - medium strength, is precocoius, being grafted on the M106 graft support, bears fruits in the year 3 after planting on short formations, but also on offshoots and twinges. It presents increased resistance against the attack of Venturia inaequalis and of Posodphaera leucotricha.

The production potential at the age of 6 years i 25-30 t/ha (1250 trees/ha). The fruit has 20 9g., is very hansome, coloured in vivid red on the sunbathed side, with a very good taste. The maturartion period (summer - autumn): the first prima decade of September.

The **Real** breed (sin.9/78 – 82)**,** obtained from Prima x natural pollenation, with dry seeds irradation in doses of 8000 R, homologated in the year 2007.

The tree has a small - medium strength and bears fruits on offshoots and twinges. It is resistant against the attack of Venturia inaequalis and is weakly attacked by Podosphaera leucotricha.

The production potential at the age of 6 years is 25-30 t/ha (1250 trees/ha). It bears fruits without any fruit bearing alternance. The fruit has 185 g., has the form of a cone frustum and is red on 2/3 of its surface. The pulp is white–yellowish, juicy, sweet- acidulated, with a good taste. The harvesting maturity takes place at the end of August – the beginning of September.

The synthetic data regarding the principal characteristics of the apple breeds obtained by induced mutagenesis, homologated in the period 2004-2007, are presented in the *table 1.*

The reference term is represented by the average of the 4 apple breeds.

The recently homologated apple breeds, obtained through induced mutagenesis, are of medium or medium – weak strength and are appropriate for densities of 1000 – 1250 trees/ha, grafted on the M106 graft support.

The production potential and the fruit quality, expressed by the aspect and the taste quality, are arguments for the multiplication and the extension in the commercial plantations. Under the natural keeping conditions with natural cooling, the fruits of the Redix breed resist until the first decade of March, and those of the Iris breed – until the end of November. The Irisem and Real breeds complete the variety conveyor of the breeds with summer – autumn maturation.

CONCLUSIONS

The new apple breeds obtained by induced mutagenesis at the Voineşti Station, homologated in the period 2004-2007, present o series of superior features, expressed firstly by the genetic resistance against the principal diseases, but also by the superior fruit qualities, the high productive potential, with important economical advantages.

As compared with the standard disease sensible apple assortment, that needs 15-16 treatments for the maintenance of a suitable phitosanitary status, for the presented apple assortment 6-8 treatments - only with insecticides - are necessary for pest control. In the years with abundant rainfalls, also 1-2 treatments with fungicides for Gleosporium control may be applied.

The exclusion of the fungicide products, the use of insecticides with a high selectivity degree, correlated with the quality and the productivity of the new homologated apple breeds, represent basically arguments for the promotion and for the extension in the new orchards to be created in our country.

In the variety conveyor, the Iris apple breed can replace the Frumos de Voineşti apple breed and the Redix breed replaces the Starkrimson breed - of the breeds sensible to the consecrated diseases, but they can compete with any of the resistant apple breeds, homologated and extended in the culture. The Irisem breed, which presents an exceptional fruit quality, can be extended; besides the Prima breed – and the Real breed can replace, without reserve, the Prima breed.

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Table 1. The principal characteristics of the apple breeds obtained by induced mutagenesis

Breed	Strength	Production potential		Fruit weight (g)	SU %	Maturation period	Consumption period
		t/ha	Dif. ±				
Redix	medium	38,6	+ 9,0***	160	12,5	20-30.IX	01.X-10.III
Iris	medium – weak	34,6	+ 5,0***	150	14,0	10-20.IX	21.IX-30.XI
Irisem	weak - medium	19,9	- 9,7000	209	14,7	01-10.IX	11.IX-30.IX
Real	weak – medium	25,5	- 4,1000	185	12,9	20-31.VIII	01.IX-15.IX

DL 5% = 1,30; DL 1% = 1,99; DL 0,1% = 3,18

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ENLARGING THE PRODUCTIVE CAPACITY OF ALMOND SPECIES BY MODIFICATION OF ASSORTMENT

SCHEAU V., LASLO V., DOMUTA C, MURG Silvia, BUIE F.

INTRODUCTION

In 1979 the fruit tree census showed that in Bihor County there were 10.000 almond trees and it was on the first place among the Romanian counties. This was the only census in which the almond as a specie did not appear included with "other species" (M. Popescu and colab., 1982).

Systematic studies on almond have started in Oradea in 1975 and were focused on two aspects:

- studies of behavior of almond trees and introducing in culture of new species from the assortment of great cultivating countries – such as France, Italy, Spain, USA, California - in Oradea, Sisterea, Sacueni, Cadea, Diosig (Scheau V. and Colab., 1987, Scheau V. and colab., 1989, Scheau V. and colab. 1994, Scheau V. and colab. 1997).
- Obtaining new species, better adapted to specific soil and climate conditions of the area (Gatea M. and colab. 2004, Scheau V. and colab.2006).

In the countries with traditions in cultivating almond trees, the replacement rate of the assortment takes place at 8-10 years, while in Romania it "stays still".

MATERIAL AND METHOD

In order to introduce in culture of almond trees new species, in the countries with great traditions in producing almonds, took into consideration 5 comparative cultures, with 89 species and hybrids, planted linearly, with 12 trees on a raw.

For each experience there were made observations and determinations regarding: the fructifications periods, percentage of flower buds affected by law temperatures during winter, percentage of recovering flower buds in spring, the surface of trunk, the number of flowers on linear meter of branches, production of fruit and core ?ha, physical and chemical characteristics of the fruit(weight, growth, percentage of double core, fat and proteinic substances, behavior towards the attack of main illnesses and pests.

For creation of new species, after 4 years of study of the hybrids, there were selected 48 and 56 elites which have been grafted on almond and were planted in 1994 and 1999. The planting was linear, with 5 trees on a variety, in contest, comparative micro-cultures.

The observations and determinations were the same as for comparative cultures for contest.

RESULTS AND DISCUSSION

Due to lots and lots of data, accumulated during 3 decades of research work, we will be referring only to production of core, the essential element in promoting new species of almond for future plantations.

In Table 1 we can find the presentation of the evolution of almond assortment, during distinctive time periods, when there were major changes in the assortment.

During 1975-1982, there were multiplied the following species: Primorski, Nikitski 62, Cramsky, Preanai and Burbank, having an average production of 316,9Kg/ha.

Between 1983 and 1986, only Primorsky remains from the old assortment and new species are introduced: Texas, marculesti 2/1, Sudak, Ardechoise and Bruantinne and due to this the core production / ha rises with 55,4%.

During 1987 -2005 other 3 species are introduced in the almond assortment: Mary Dupuy, Pomorie and Retsou. Compared with the average production during 1975-1982, the core production rises with 71,9%, or, compared with the average production of the period 1983-1986, the production rises with 16,5%.

Beginning with 2006, as the new species were confirmed – Ana, Viola, Sandi, Sabina, April and also when the hybrids H14/81/81, H4/1451/82, H1/2025/84 will be confirmed, the perspective of the growths of core production/ha will be 81,1%, compared with the average production of the period 1987-2005.

Table 2 shows the situation of the new cultivated almond assortment, through the number of the grafted trees in nursery during 1981-1992 and 2000-2005.

From a total of 224,9 thousand grafted trees beginning with 1983, the assortment introduced in the area represents 186 thousands, meaning 82,8%.

Texas was multiplied in percentage of 18,2%, Bruantinne 15,1%, Ardechoise 12,2%, Marculesti 2/1 9,6%, Mary Dupuy 7,4%, Pomorie 7,3%, Retsou 6,9% ans Sudak 6,1%.

CONCLUSIONS

Introduction of new Romanian species: Ana, Viola, April, Sandi, Sabina in culture and of hybrids H14/851/81, H4/1451/82 and H1/2025/84, having growths of core production /ha of 81% compared with anterior period (1987-2005), gives an important impulse to almond cultivation in our country.

Table 1. The evolution of the almond assortment at S.C.D.P. Oradea

Nr. crt.	1975 – 1982			1983 - 1986		1987 - 2005		Perspectivă	
	Sortiment		Producție miez kg./ha.	Sortiment	Producție miez kg./ha.	Sortiment	Producție miez kg./ha.	Sortiment	Producție miez kg./ha.
1	Primorski		432,9	Primorski	432,9	Primorski	432,9	Primorski	432,9
2	Nikitsky 62		359,3	Texas	589,3	Texas	589,3	H 3/1344/82 (Ana)	823,7
3	Crâmsky		285,7	Mărculești 2/1	540,9	Mărculești 2/1	540,9	H 1/2033/84 (Viola)	740,2
4	Preanâi		338,3	Sudak	486,3	Sudak	486,3	H 4/2205/84 (Sandi)	887,2
5	Burbank		168,2	Ardechoise	420,2	Ardechoise	420,2	H 1/2043/84 (Sabina)	762,1
6				Bruantinne	485,8	Bruantinne	485,8	H 16/1919/84 (April)	614,1
7						Mary Dupuy	581,5	H 14/851/81	930,5
8						Pomorie	761,0	H 4/1451/82	1043,8
9						Retsou	1005,6	H 1/2025 /84	982,7
10	**Media**	**Kg./ha**	**316,9**		**492,6**		**544,8**		**801,9**
11		**%**	**100,0**		**155,4**		**171,9**		**253,0**

Table 2. The situation of almond breeds grafted in the nursery at S.C.D.P. Oradea

	Anul / Soiul	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	2000	2001	2002	2004	2005	Total 1981-2005	
																			mii buc.	%
1	Burbank	-	2,0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2,0	0,9
2	Nikitski 62	-	4,0	5,0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	9,0	4,0
3	Preanâi	2,3	2,0	-	-	1,0	-	-	5,0	-	-	-	-	-	-	-	-	0,8	11,1	4,9
4	Primorski	0,5	2,0	5,0	0,6	-	-	-	0,6	5,0	1,0	1,0	1,1	-	-	-	-	-	16,8	7,4
5	Texas	-	-	2,0	-	4,0	4,0	6,7	15,0	2,3	2,1	1,1	1,0	0,3	0,7	1,3	0,4	-	40,9	18,2
6	Mărculești 2/1	-	-	3,0	0,2	1,5	4,0	2,4	4,0	2,4	1,0	1,1	1,0	-	-	0,6	0,4	-	21,6	9,6
7	Sudak	-	-	3,0	1,4	2,0	1,0	1,0	1,1	1,1	1,0	1,2	1,0	-	-	-	-	-	13,8	6,1
8	Ardechoise	-	-	5,0	1,4	1,0	4,0	2,1	5,0	2,1	5,0	0,8	1,0	-	-	-	-	-	27,4	12,2
9	Brauantinne	-	-	5,0	1,3	7,0	4,0	2,1	5,0	2,1	5,0	1,0	1,0	-	-	-	0,4	-	33,9	15,1
10	Mary Dupuy	-	-	-	-	3,5	4,0	0,3	4,0	1,5	1,0	1,0	1,1	-	-	-	0,4	-	16,8	7,4
11	Pomorie	-	-	-	-	-	-	2,7	8,0	1,4	1,0	1,1	1,0	-	-	0,9	-	0,4	16,5	7,3
12	Retsou	-	-	-	-	-	-	2,5	8,0	1,4	1,0	1,1	1,1	-	-	-	-	-	15,1	6,9
Total pe ani		**2,8**	**10,0**	**28,0**	**4,9**	**20,0**	**21,0**	**19,8**	**55,7**	**19,3**	**18,1**	**9,4**	**9,3**	**0,3**	**0,7**	**2,8**	**1,6**	**1,2**	**224,9**	**100**

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NEW DATA CONCERNING THE GRAFTING OF *DIOSPYROS KAKI* L.

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Keywords: chip budding, bark grafting, grafting in the growing bud

ABSTRACT

The researches have been sustained in the field of Fruit Growing Department from U.S.A.M.V. Bucharest, for establish the best grafting method for persimmons cultivars: O'Gosho, Sharon, Hana Fuyu, Coroa de Rei, Rojo Brillante and the ANPL, CPL populations, on the rootstocks *Diospyros virginiana* L. and *Diospyros lotus* L. The methods used for grafting have been: grafting in the growing bud, bark grafting, chip budding, side grafting and omega. At the grafting in the growing bud, the best results were obtained for the cultivars: Hana Fuyu, Sharon and CPL population; At the bark grafting and chip budding, a bigger grafting percentage was obtained for Hana Fuyu, CPL population and Coroa de Rei. At the mechanical grafting (omega) the results were none. The best results were obtained using the *D. virginiana* L. rootstock.

INTRODUCTION

The main purpose was establish of the compatibility degree at the grafting of some persimmon's cultivars on rootstocks *Diospyros virginiana* L. and *Diospyros lotus* L. The researches have been sustained at U.S.A.M.V. Bucharest and Calarasi County.

MATERIALS AND METHODS

The *Diospyros virginiana* and *Diospyros lotus* L. rootstock were obtained through the generative method. The seedling grew normally, realizing an optimal thickness for grafting. The budding was made in the second half of April. During all the year there were made soil management necessary for the growing of the trees.

In orchard the cultivars grafted on *D. virginiana* L. rootstock are: O'Gosho, Sharon, ANPL population, Hana Fuyu, CPL population, Coroa de Rei using the methods grafting in the growing bud, bark grafting, side grafting and chip budding. In the First Field the cultivars Rojo Brillante and Coroa de Rei were grafted using bark grafting method.

On *D. lotus* L. rootstock has been grafted cultivars: Coroa de Rei, Rojo Brillante, Sharon and O'Gosho using grafting in the growing bud, chip budding and omega.

RESULTS AND DISCUSSIONS

The grafting in the orchard. Grafting in the growing bud (table 1), made on 16 and 21 April 2007, has the best results the cultivars Hana Fuyu (50%), Sharon (42.86%) and CPL population (40%) and smaller results for the cultivar O'Gosho (25%) and ANPL population (33.3%). The average percentage of grafting using this method was 39.01%.

At the bark grafting the average percentage of grafting was of 61.19%, outrun the results obtained at the grafting in the growing bud. At the cultivar O'Gosho and CPL population, the percentage of successful graft was 100%; at ANPL population 60%, Coroa de Rei 57.14% and Hana Fuyu 50%. Remarkably is the fact that at the Sharon cultivar the percentage of successful graft was 0%. This behaviour undesired is owed to the frozen of the grafts, even if at the grafting time, the buds and the woods seems to be viable.

At the chip budding method, the average percentage of grafting was of 66.17%. The best results had: Hana Fuyu, CPL population and Coroa de Rei, which realise a percentage of

successful graft of 100%. Results relative weakly were obtained at the cultivar O'Gosho (50%) and ANPL population (50%).

The cultivars Sharon and Coroa de Rei grafted in side grafting obtained a percentage of successful graft of 100%.

In the nursery were grafted the cultivars Rojo Brillante and Coroa de Rei. At Rojo Brillante cultivar obtained at the grafting in the growing bud a percentage of successful graft of 20% and at the bark grafting 47.06% and Coroa de Rei 80% at the bark grafting. During this year (2007) on April 12 were made grafting using the *D. lotus* L. rootstock too, with the cultivars: Coroa de Rei, Rojo Brillante, Sharon and O'Gosho, using the methods grafting in the growing bud, chip budding and omega.

From the date registered in the table number 2 conclude as follows:

- At the grafting in the growing bud, the percentage of successful graft was of 42.50%. The biggest percentage of successful graft was at the cultivars Sharon and O'Gosho (60%) the smallest at Coroa de Rei and Rojo Brillante (25%).
- At chip budding grafting, the results were superior to the grafting in the growing bud, the best results was obtain at the cultivar Rojo Brillante (69.2%) and the smallest at Sharon (40%).

From ours studies and observations results that on this rootstock capacity of vegetating starting of the graft was small.

CONCLUSIONS

1. Among the methods used for the persimmon cultivars grafting, the most efficient were bark grafting and chip budding.
2. The cultivar Coroa de Rei realised a percentage of successful graft of 100% in chip budding and side grafting and CPL with the methods bark grafting and chip budding.
3. The bark grafting was superior to the grafting in the growing bud.
4. The grafting on *D. lotus* L. rootstock realised a small percentage of graft and the grafts stagnated in growth.

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Table 1

The grafting on *D. virginiana* L. rootstock in the orchard and in the nursery (2007)

Cultivar / population	Grafting date	Grafting method			
		Grafting in the growing bud	Bark grafting	Chip budding	Side grafting
		% in catching grafting			
Grafting in the orchard					
O'Gosho	16.04	25	100	50	
Sharon		42.86	0		100
ANPL	21.04	33.33	60	50	
Hana Fuyu		50	50	100	
CPL		40	100	100	
Coroa de Rei		42.86	57.14	100	100
Average		39.01	61.19	66.17	
Grafting in the nursery					
Rojo Brillante	25.04	20	47.06		
Coroa de Rei		-	80		
Average		20	61.03		

Table 2

The grafting on *D. lotus* L. rootstock (2007)

Cultivar	Grafting method	Grafting method		
		Grafting in the growing bud	Chip budding	omega
		% in catching grafting		
Coroa de Rei	12.04	25.0	58.8	-
Rojo Brillante		25.0	69.2	-
Sharon		60.0	40.0	-
O'Gosho		60.0	60.0	0
Average		42.5	54.5	-

Fig.1 – Grafting in the growing bud

Fig. 2 – Bark grafting

Fig. 3 - Side grafting

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THE COMPLETION OF APRICOT ASSORTMENT WITH NEW CULTIVARS

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Keywords: breeding, selection, hybrid, ripening period

ABSTRACT

Fruit Research Station Constanta started a great breeding programme for apricot species since 1971 year having more objectives as following: increasing of temperature variations resistance and inducing the late blooming character; improving of fruit qualities as: appearance, fruit weight, colour of skin and flesh, sugar and dry matter content, firmness; increasing of productivity; resistance of cultivars to different pathogens and especially free of virus; extension the harvesting season in order to obtain cultivars with late ripening as well as cultivars with early and very early ripening. For realized these objectives many crossing were made from which hybrid descendence were elected some selections, which were grafted on rootstocks "wild apricot" and studied in comparative crop near old cultivars. Among these selections ten the best were homologated as a new cultivars and spread out to orchard owners, with the following name: Fortuna, Auras, Danubiu, Cristal, Amiral, Orizont, Augustin, Ceres, Euxin, Histria.

INTRODUCTION

Apricot breeding has been conducted by many researchers from entire world where apricot tree finds good conditions to grow. Researchers from Italy (Penonne, 1999; Nicotra et al., 2006; Guerriero et al., 2006), France (Audergon et al., 1999), Spain (Egea et al., 1999), Greece (Syrgianidis et al., 1999), Bulgary (Tsoneva, 1999), New Zealand (Hofstee, 1999), Slovak Republic (Benedicova, 2006) and many others have their own apricot breeding programs. In Romania, the apricot breeding program started in1952 having under the leadership of Dr. Vasile Cociu. He and many others researchers (Topor 1997, 1999, 2006; Balan 1997, 2006) worked for this program and realized many cultivars including: Fortuna, Auras, Danubiu, Cristal, Amiral, Orizont, Augustin, Ceres, Histria and Euxin.

MATERIALS AND METHODS

The main objectives of the Romanian apricot breeding program were: to prolong the harvest season; to increase high quality of fruit regarding size, high sugar content, flesh firmness, good aroma, skin and flesh colour, good taste; to improve the resistance to damage in transport, to improve the resistance to diseases, such as Sharka or plum pox-virus; and to improve yields.

To pursue these objectives, we employed standard breeding techniques of cross pollination, self pollination, and open pollination. More than 150 cross combinations were made in Constanta. More than 10,000 seeds were obtained from cross combinations and another 10,000 from self and open pollination. More then 18,000 hybrids were subjected to evaluation in a hybrid orchard. The 380 best phenotypes, genotypes, and a control were tested. From these, 10 new cultivars were released locally and were registered at the Official Catalogue of State Institute for Variety Testing and Registration. The old Romanian cultivars Neptun, Traian and Litoral were used as control cultivar for different ripening period. A good starting point for this work was the apricot gene bank which had more then 600 clones from Asia, Europe and America.

Between 1984-2007 years on made the selection of hybrid offspring, the chosen of far-reaching hybrids and then were studied in comparative crop near old apricot cultivars.

Each genotype have been studied for the biological and pomological characters especially regarding the blooming date, fertility, productivity, growth vigour, resistance to the temperature oscillations and diseases, fruit quality (shape, flesh colour, size, stone adherence, taste, aroma, dry matter a.s.

Climatic conditions

The Fruit Research Station Constanta is situated in a region who has a temperate continental climate, characterised by mild winters whose lowest temperature not descend below -17°C, and the summers are warm and very arid. The annual precipitation's averages around 400 mm, from which 150-200 mm fall during the vegetation of trees (April-September). The culture of apricot trees in this region has good results only in conditions of irrigations.

The wind blow almost all the time of year with different frequency and force (beetwen 7-10 m/s) and the most deleterious is in the spring in blossoming period when we work at the hybridizations.

RESULTS AND DISCUSSION

Blooming period

Blooming of the apricot selections and cultivars in variable depending on the evolution in spring climate the variations among years could be of up to one month (Table 1). Referring to last five years, the apricot selections were blooming earliest at 5-8 March 2002 and latest at 25-26 April 2003.

Into 2002 year, when the fruit have had 1.5-2.0 cm diameter, one big frost produced (-3-5^{O}C in first of May) and destroyed all yield.

In the other years the apricot flowered in last part of March (24-28 March 2004) or in April, on the first part in 2006 year (3-5 April) and on the last part in 2003 year. All these new cultivars are self-fertile.

Harvesting period

The ripening period is very early for: Fortuna and Auras, early for Ceres, Danubiu, Cristal, medium for Amiral and Orizont, late for Euxin, Histria and Augustin.

In the south-east part of Romania, where is localized Fruit Research Station Constanta very early cultivars are ripening from 10 to 25 June, early cultivars from 25 June to 10 July, mid-season from 10 July to 25 July and late ripening season after 25 July to 15 August (Table 1).

Productivity and fruit quality

In the apricot breeding program cultivars with a high productivity, self fertility and regular yields were developed. This was achieved through selection of thousands of hybrids. The recent cultivars are very productive and self fertile. These fruits are big, nice coloured, good-flavoured, have a non-adherent seed, and have multiple-uses (Table 2).

CONCLUSIONS

The new apricot cultivars are characterized as following:

Fortuna: Sam no.1 x Mari de Cenad. Tree: strong vigor, spreading appearance, bearing habit on spurs and one year old shoots, self fertility 33.6%, open fertility 49.7%, time of flowering early; Fruit: large size (52 to 70 g), round, cavity depth intermediate, depressed apex, orange skin colour with intermediate red blush, orange flesh colour, coarse texture of

flesh, firm, stone has medium size, non-adherence, sweet core; Time of ripening: very early, 16-29 June highly productive, over 16 t/ha.

Auras: Sam no. 1 x Stark Early Orange. Tree: Strong vigour, upright appearance, bearing habit on spurs prevalent, self fertility 71.7%, open fertility 78.3%, time of flowering late (the latest); Fruit: medium/large size (55-65 g) triangular shape, cavity depth deep, rounded apex, light orange skin color with intermediate red blush, orange flesh colour, intermediate texture of flesh, medium firmness of flesh, stone has medium, non-adherence, strong bitterness core, rich aroma, excellent eating quality; Time of ripening: early, 17-30 June, highly productive, over 15 t/ha.

Cristal: Sam no. 1 x Mari de Cenad. Tree: Intermediate vigour, upright appearance bearing habit on spurs and one year old shoots, self fertility 44.1%, open fertility 85%, time of flowering intermediate; Fruit: medium (42-46 g), oblong/rectangular shape, cavity depth intermediate, rounded apex orange skin colour with slight red blush, orange flesh colour, fine texture of flesh, medium firmness, stone oblong shape, medium percent of flesh weight, non-adherence, bitter core, rich aroma. Time of ripening: early, 19-30 June, very productive, over 14 t/ha.

Danubiu: Sam no. 1 x Mari de Cenad. Tree: Intermediate vigour spreading appearance, bearing habit on one year old shoots, self fertility 40.2%, open fertility 55.3%, time of flowering intermediate; Fruit: medium/large size (48-55 g), oblong shape, cavity depth deep, rounded apex, light orange skin colour the blush mostly red in certain years, orange flesh colour, intermediate texture of flesh, firm, large stone non-adherence, bitter core, rich aroma, excellent eating quality; Time of ripening: early, 17-20 June, very productive, over 15 t/ha.

Ceres: NJA 17 x R9P53 hybrid. Trees vigour is medium. Bearing more on spurs and one year old shoots. The season of flowering is early, self-fertile. The harvest maturity is early, 25-28 June. Fruit size is medium, average 46.0-68.0 g, round shape. The ground colour of the skin is light orange the blush mostly red, flesh light orange coloured, good firmness, free stone, strong bitter core. Can be used for fresh consumption and industrial products. It is very productive and resistant to diseases, free virus.

Amiral: Mari de Cenad x CR 24-12. Tree: strong vigour, upright appearance, bearing habit on spurs and one year old shoots, self fertility 71.7%, open fertility 78.3%, early season of flowering. Fruit, very large fruit size (69-94 g), oblong shape, cavity depth deep, rounded apex, orange skin colour with intermediate red blush, orange flesh colour fine texture, firm flesh, stone elliptic shape, big percent stone of fruit weight, no adherence, bitter core, rich aroma, excellent eating quality; Time of ripening: early, 26 June-5July, high productive, over 16 t/ha.

Orizont: Mari de Cenad x CR 24-12.Tree: strong vigour, upright appearance, bearing habit on spurs prevalent, self fertility 65.7%, open fertility 81.5%, medium season of flowering. Fruit: large size (55-67 g), oblong shape, cavity depth deep, rounded apex, light orange skin colour with intermediate red blush, light orange flesh colour, fine texture of flesh, medium firmness, stone shape is oblong, the size is medium to large, non-adherence, sweet core, rich aroma, excellent eating quality. Time of ripening: medium, 1-10 July, highly productive, over 16.5 t/ha.

Histria obtained by crossing Worley's peach x Sulmona.

Trees vigor is medium. Bearing more on spurs and one year old shoots. The season of flowering is late, self-fertile. The harvest maturity is late, second part of August (8-15 August). Fruit size is medium 57-71 g, round shape. The ground colour of the skin is orange, the blush mostly red. Flesh orange, medium firmness, rough texture, rich aroma. The stone is free, round shape, sweet core. Is very productive and resistant to main diseases, virus free. Can be used for fresh consumption or industrial products.

Euxin obtained by crossing two complex hybrids R30P62 (Marc. 18/2 x 17/2) and R41P62 (Marc. 16/7 x 73/9).

Trees vigour is medium. Bearing more on spurs and one year old shoots. The season of flowering is medium, self-fertile. The harvest maturity is late, second part of August (6-14 August). Fruit size is medium (55-75 g), round shape. The ground colour of the skin is orange, the blush mostly red. Flesh is orange, medium firmness, fine texture, rich aroma. The stone is free, round shape, sweet core. Is very productive and resistant to main diseases, virus free. Can be used for fresh consumption or industrial products.

Augustin: Marculesti 9/5 x Sirena. Tree: intermediate vigour, upright appearance, bearing habit on spurs and one year old shoots, self fertility 47.1%, open fertility 76.3%, medium season of flowering. Fruit: medium/large size (55.0-61.0 g), oblong shape, cavity depth deep pointed apex, orange skin colour, with intermediate red blush, orange flesh colour, intermediate texture of flesh, medium firmness, rich aroma, stone shape is round, the size is medium, non-adherence, sweet core, rich aroma, excellent eating quality.

Time of ripening: late (the latest cultivar from apricot cultivated assortment into Romania), 9-15 August, highly productive, over 17.0 t/ha.

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Tables

Table 1. The blooming and the ripening period

Cultivar	Perid of blooming[1]		Fertility %	Date of maturity[2]
	in the early year	in the late year		
TRAIAN-control	5.III	25.IV	31.4	21-26.VI
FORTUNA	3.III	24.IV	49.7	16-29.VI
AURAS	8.III	29.IV	78.3	17-30.VI
CRISTAL	6.III	25.IV	85.0	19-30.VI
DANUBIU	5.III	26.IV	55.3	17-20.VI
CERES	6.III	25.IV	32.2	25-28.VI
NEPTUN-control	7.III	28.IV	55.7	13-15.VII
AMIRAL	7.III	26.IV	78.3	26.VI-5.VII
ORIZONT	7.III	26.IV	81.5	1-10.VII
LITORAL-control	6.III	26.IV	44.8	7-13.VIII
HISTRIA	8.III	26.IV	41.8	8-15.VIII
EUXIN	7.III	25.IV	52.7	6-14.VIII
AUGUSTIN	7.III	28.IV	76.3	9-15.VIII

[1]early years: 2001 and 2002; late years 1996 and 2003

[2]Traian control cultivar for early ripening season; Neptun for mid-season ripening and Litoral for late ripening period

Table 2. The apricot yield and the fruit qualities

Cultivar	Yields/Ha (average 5 years)	Fruit weight g (average)	% stone of fruit	Dry matter Brix degrees
TRAIAN-control	10.0-11.8	45.0-48.5	3.9-8.6	13.2
FORTUNA	15.5-16.0	52.0-70.0	4.0-7.6	13.0
AURAS	14.8-15.6	55.2-65.7	4.9-11.5	14.0
CRISTAL	13.5-14.9	44.2-46.0	4.3-7.8	13.0
DANUBIU	12.0-15.9	48.7-55.0	4.9-8.1	12.0
CERES	12.5-15.0	46.0-68.8	5.2-7.7	12.0
NEPTUN-control	14.0-15.8	48.7-56.8	5.3-8.8	13.0
AMIRAL	15.5-16.0	69.0-94.0	3.4-6.3	16.5
ORIZONT	15.0-16.5	55.8-67.6	6.1-11.4	16.0
LITORAL-control	14.8-16.7	35.5-45.3	5.7-11.9	14.3
HISTRIA	14.8-17.3	57.4-71.4	4.8-7.3	14.5
EUXIN	12.5-14.8	53.0-78.0	4.9-8.6	13.8
AUGUSTIN	16.0-17.4	55.5-61.0	5.2-8.5	18.0

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QUALITY PRELIMINARY RESULTS REGARDING THE BEHAVIOUR OF SOME APPLE GENETIC DISEASE RESISTANT SELECTIONS, OBTAINED BY SEXUATE INTERSPECIFIC HYBRIDIZATION

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Keywords: promising selections; fenology; yield potenţial; fruit characteristics.

ABSTRACT

As a result of evaluation through hybrid series 1992 (by L. Şerboiu and Gabriela Uncheaşu), a number of 9 promising selections identificated and promoted in the 2nd test: 5 promising selections (V 95/12; V 95/15; V 95/49; V 95/52; V 95/55) from the combination (Prima x Starkrimson); 2 selections (V 95/230 and V 95/272) from the combination (Prima x Discovery); one selection (V 97/192) from the combination (Prima x Generos) and V 98/72 from (Pionier x Prima).
The study concerning this promising selections consist in the main tree characteristics (fruit-bearing fenology; yield potential; disease resistance; strength growth and of the fruit characteristics (weight, colour, storage capacity).
All selections studied have prove a field scab resistance and higher powdery mildew resistance (between 5,6-21,0% haves attacked comparable with the witness, Jonathan – 80% haves with attack).
The yield potential were between 0,5 t/ha (V 95/55) and 6,o t/ha (V 95/230), for the trees in the 3 nd or 4nd year after plantation.
The main fruit characteristics were weight average between 153 g (V 95/15) to 237g (V 95/12); red colour with same thade on almost 80% of the surface; storage capacity until February.
All the fruits proved high taste quality as good as commercial varieties.

INTRODUCTION

The promotion in culture of a new breed is based on a series of superior characters and features, of which the high production potential and the superior fruit quality are essential.

The completion of this features with others, equally important, as: the resistance to specific diseases, the growth strength, the high capacity to put into account the ecological resources – increases the value of the new breeds.

Among the said characteristics, the genetic disease resistance represents a favourable impact on the production costs and on the environment, a fact that made the resistance a priority objective in the apple breed improvement.

Many researchers worldwide (Alston, Hough, Dayton, Lamb, Shay, William's) and in our country (Cociu, Moruju, Ivan), dedicated their activity to this objective, starting with the identification of the resistance sources, the perfection of the improvement methods, obtaining the first 3 – 4 generations and the introduction into production of the first disease resistant apple breeds (Prima, Priam, Priscilla, Sir-Prize, Florina, Liberty, etc.).

Later researchers like: Blazek, Branişte (1981, 1983, 1989, 1990, 2003, 2005), Ficher (1994), Lespinase (1984), Şerboiu and Uncheaşu (1998, 2006) continued and enriched the assortment with other disease resistant breeds: Freedom, Goldrush, Romus1, Romus 3, Romus 4, Romus 5, Rebra, Nicol, Colmar, William's, Pride, Enterprise, Golden Lasa, Golden Orange, etc.

The promoter and continuator of this program, the station Voineşti, as a result of the performed researches, homologated the breeds Voinea, Pionier, Generos, Ciprian – and lately Luca breeds largely promoted into culture.

Also presently a great number of selections with perspective are under study.

In the present work a part of the obtained results are presented, referring to the behaviour in contest micro culture of 9 selections with perspective.

MATERIALS AND METHODS

After the selection done in the framework of the hybrid series 1992 by L. Şerboiu and Gabriela Uncheaşu, the following 9 elites were identified and promoted in the contest micro culture (T2): V 95/12, V 95/15, V 95/49, V 95/52, V 95/55, belonging to the combination Prima x Starkrimson; V 95/230 and V 95/272, belong to the combination Prima x Discovery; V 97/192 descendent of the combination Prima x Generos and V 98/72 (combination Pionier x Prima), elites which by their characteristics reach the standards needed for homologation.

Grafted on the graft bearer M 106, the selections were planted at 4x2,5 m distance. The technology applied was specific for the apple plantations, with the exception of the not applied fungicide treatments.

The sensible breeds Jonathan and Golden Delicious were used as witnesses, their role being to demonstrate the existence and the infection pressure of the pathogenic agents (scarf, mildew), but also the resistant breeds Ciprian and Generos, for their fruit quality and the productive potential.

The stationary method was used as study method, the main observations being performed referring to the la phenology of the fruit bearing organs, the tree growing strength, the production potential, the disease behaviour (scarf, mildew, bacterial burn) and aspects regarding the fruit quality (size, colour, SU% content, keeping capacity, etc.)

RESULTS AND DISCUSSIONS

a) Regarding the phenology of the blossoming, influenced by the evolution of the meteorological conditions at the vegetation beginning, the blossoming was registered in the two springs at different dates, with fluctuations of 10 – 12 days from year to year. In the same year, the selections blossomed in groups, with differences of 2 – 4 days, but with a sufficient great simultaneity (6 – 8 days), which assured their pollination.

b) Growth strength. Although registered yearly, the table 1 presents the data noted in the fourth tree age year. In the aggregate of the studied selections, the growth strength oscillates from 5,6 cmØ trunk at the selection V 98/72 - to 7,8 cm Ø trunk at the selection V 95/52, the other being grouped around the average value of 6,1 cm. A particular case is represented by the sensible witness breeds Golden, Delicios (3,7 cm Ø trunk) and Jonathan (4,0cm Ø trunk), which in the absence of fungicide treatments lost prematurely the leaves, a fact substantially affecting the growth.

c) Production potential. The presented data are not very edifying regarding the production potential of the studied selections, being registered in the tree age years 3 – 4. All the same, at the selections V 95/230, V 95/49 and V 95/272 productions much greater than the experience's average (6,0 to/ha – V 95/230; 5,5 to/ha – V 95/49; 4 to/ha – V 95/272) were registered. The production absence at the breeds Jonathan and Golden Delicios (Mt sensible) is explained by not applying the fungicide treatments, a fact conducting to a weak photosynthesis capacity of the leaves – and implicit to the lack of differentiation of the fruit growing buds.

d) Disease behaviour

Scarf, mildew

Under the condition of not applying fungicide treatments, the studied selections presented field immunity against scarf, both in of the leaves and of the fruits, with a low

degree of scarf attack and a reduced degree of mildew attack, variable from year to year, depending on the years' climatic conditions.

To be mentioned is the fact that, although the mildew attack frequency at the studied selections varies between the limits 5,2% (V 95/55) – 21,0% (V 98/72), its intensity is reduced, not exceeding the value 1. This aspect permits to maintain the leaves in good condition also in the case of not applying fungicide treatments, as compared with the more sensitive witness breeds, at which the frequency values, both at scarf and at mildew, are high (48,4% at scarf and 80% at mildew – Jonathan and 49,7% respectively 30% - Golden) - and the intensity is noted with values between 1-6, prevailing the note 4.

The presence of the scarf and mildew attacks at the 2 witness breeds, Jonathan and Golden, with the mentioned values, demonstrates the presence and the pressure of the pathogenic agents in the orchards – but also the resistance of the presented selections against the infection pressure (tab.2)

Erwinia – Although under the climatic conditions of the year 2007 the bacterial burn attack existed in the plantations, the presence of the pathogenic agent was not registered in the case of the studied selections, the attack degree being 9 (the notation being made from 1 to 9; 1 = very sensitive; 9 = resistant).

The main characteristics of the fruits

The data presented in the table 3 render evident the integration of the studied selections into the normal parameters for a commercial breed. The more intimate aspects, as: the sugar/acid ratio, their harmonization into the taste qualities - although not revealed in the table - are situated at a normal level for a commercial breed.

CONCLUSIONS

The agro-technical characteristics of the selections V 95/49, V 95/239 and V 95/272 regarding the field immunity to scarf, the reduced intensity of the mildew attack (value = 1), associated with the attractive aspect of the fruits (red colour, spherical form, size 171 – 189g), the consumption period (September – February), recommends them for homologation - the destination being the consumption in fresh status.

The study regarding the behaviour of the 9 selections in the contest micro culture is continued in view of the correct establishment of the production potential, the data presented in the work being the production average in the 3-4 tree age year.

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Tables

Table 1. The growth strength and the production potential of some apple selections with genetic disease resistance

Nr.	SELECTION / BREED	Growth strength (cm Ø trunk) (Year 4 after planting)	Production potential to/ha (average year 3-4 of age)
1	V 95/12	7,5	1,8
2	V 95/15	6,8	2,9
3	V 95/49	5,8	5,5
4	V 95/52	7,8	1,3
5	V 95/55	7,6	0,5
6	V 95/230	7,2	6,0
7	V 95/272	6,1	4,0
8	V 97/192	7,0	0,6
9	V 98/72	5,6	1,1
10	Ionathan (Mt.sens.)	4,0	0
11	Golden del. (Mt.sens.)	3,7	0
12	Generos (Mt.resist.)	5,4	2,3
13	Ciprian (Mt.resist.)	5,0	6,5
	AVERAGE	6,1	2,5

Table 2. The disease behaviour of some resistant apple breeds under the conditions of not applying the fungicide treatments

Nr.	Selection / breed	Scarf		Mildew		Bacterial burn
		F%	Intensity	F%	Intensity	
1	V 95/12	0	0	18	1	0
2	V 95/15	0	0	16,6	1	0
3	V 95/49	0	0	9,6	1	0
4	V 95/52	0	0	6,8	1	0
5	V 95/55	0	0	5,2	1	0
6	V 95/230	0	0	8,8	1	0
7	V 95/272	0	0	10,0	1	0
8	V 97/192	0	0	5,6	1	0
9	V 98/72	0	0	21,0	1	0
10	Ionathan (Mt.sens.)	48,4	1-^{4}6	80,0	1-^{5}6	0
11	Golden del. (Mt.sens.)	49,7	1-^{4}6	30	1-^{2}4	0
12	Generos (Mt.resist.)	2,0	1-^{1}3	26,8	1-^{1}4	0
13	Ciprian (Mt.resist.)	0	0	6,8	1-^{1}3	0

Table 3. The principal fruit characteristics of the apple selections with genetic disease resistance at the studied selections

Nr.	Selection / breed	Size (g)	Content in SU %	Colour	Consumption period
1	V 95/12	237	10,0	Red	IX-2 – II.2
2	V 95/15	153	13,0	„	IX-2 – III-1
3	V 95/49	171	12,8	Dark red	IX-2 – II-3
4	V 95/52	171	12,6	Red	IX-2 – II-3
5	V 95/55	182	12,4	Red	IX-2 – II-3
6	V 95/230	189	12,6	Ruby red	IX-2 – II-3
7	V 95/272	173	13,6	„	IX-2 – III-1
8	V 97/192	165	13,4	Carmine red	IX-3 – IV-1
9	V 98/72	179	13,4	Red	IX-2 – II-1
10	Ionathan (Mt.sens.)	-	-	Red	IX-3 – III-3
11	Golden del. (Mt.sens.)	-	-	Yellow + carmine red	X-1 – IV-1
12	Generos (Mt.resist.)	183	12,8	-	X-1 – III-3
13	Ciprian (Mt.resist.)	170	12,6	Dark red	IX-3 – III-2

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STUDIES REGARDING NITRATE AND NITRITE CONTENTS IN FRUITS

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Keywords: methemoglobinemy, strawberries, plums, fruits, nitrogen

ABSTRACT

Nitrates and nitrites are very toxic matters that stimulate methemoglobinemy and produce inside the human body carcinogenic products like nitrosoamines and nitrosoamides. As the quality of vegetable products depend firstly of pollutants content, the aim of the investigation was to determine the level of nitrates and nitrites, undesirable compounds in human diet. The nitrate and nitrite contents from different varieties of plums and strawberries provided by SCDP Valcea were estimated and expressed as mg/kg fresh weight. The obtained results indicate that analysed plum samples contain nitrates that ranges between 7,85 mg NO_3^-/kg and 133,49 mg NO_3^-/kg; the nitrate level in strawberries fluctuate between 120 and 216 mg NO_3^-/kg. If in plums the nitrite content vary from 0,86 mg NO_2^-/kg up to 1,47 mg NO_2^-/kg, at strawberries the inferior found limit is 2,4 mgNO_2^-/kg and the superior one is 4,08 mg NO_2^-/kg. Also, it has been found that strawberries accumulate more quantities of nitrates and nitrites than plums do. The studies that we have conducted and the obtained results are in agreement with those developed in other countries, as well.

INTRODUCTION

Since accession of Romania to European Union, vegetal products produced in our country and intended for fresh market supply or for export have to meet the EU quality requirements and food safety legislation. Official quality control system of vegetables and fruit is based on the principle of product quality assurance at all stages of production – from producer to consumer.

As a result of contamination or pollution processes, vegetal products can accumulate considerable quantities of heavy metals, nitrates, nitrites and pesticide. Study on nitrate and nitrite accumulation in vegetal products is an important question regarding the health care.

Application of nitrogen fertilizers can cause increases in concentration of nitrates and nitrites in crops. If nitrate levels in vegetal products are too high, farmers must reduce the amount of nitrogen fertilizers they use. But, the problem from the farmers' point of view is that reducing nitrogen applications is likely to obtain lower yields.

The goal of this research was to establish the levels of nitrate and nitrite from different types of plums and strawberries. Taking into account that nitrates and nitrites may accumulate in plants' tissues and are very dangerous substances for human health, their concentrations were determined. When it is known the quantity of nitrates and nitrites, it can be established the health safety of food products.

Nitrogen is absorbed by plants in the form of either ammonium (NH_4^+) or nitrate (NO_3^-), and its accumulation is influenced by a series of factors that are depending on the species, cultivar, age and soil conditions. Once nitrate is absorbed by plants, it has to be reduced by the enzyme, nitrate reductase to ammonium and assimilated via glutamate (Prakasa et al., 2000). The concentration and amount of nitrates levels in plants will vary depending on the type of vegetable, the temperature that it is grown at, the sunlight exposure, soil moisture levels and the level of natural nitrogen in the soil.

The acute toxicity of nitrate as such is low; but in foods or in the gastro-intestinal tract, nitrate may be transformed into nitrite, having a much higher acute toxicity. So, the

toxic effects of nitrate are due to its endogenous conversion to nitrite which is implicated in the occurrence of methaemoglobinaemia (inability to transport oxygen to tissues), gastric cancer (Prakasa et al., 2000) and different health disturbances (changes in vitamin level, thyroxin production and negative influence in reproduction). Methemoglobinemy is also known as "blue baby syndrome" because its first manifestation is a bluish colour of the infant's skin.

The European Commission's (EC) Scientific Committee on Food (SCF) prescribed in 1995 the Acceptable Daily Intake (ADI) of nitrate and nitrite ions according to the body weight of a person. ADI for the nitrate ion is 3,65 mg/kg body weight (equivalent to 219 mg/day for a 60 kg person) and for nitrite ion is 0,06 mg/kg body weight (equivalent to 3,6 mg/day for a 60 kg person). The SCF also advised to reduce exposure to nitrate via food and urged that good agricultural practices be adopted to ensure nitrate levels as low as reasonably achievable (SCF, Annex 4 to Document III/5611/95, European Commission).

MATERIAL AND METHODS

It was analysed 11 varieties of plums and 4 varieties of strawberries provided by SCDP Valcea.

The strawberries were harvested on 1.06.2007 and the varieties are: Magic, Premial, Calina and Prundeni. The plums were harvested on 26.07.2007 and the varieties are: Centenar, Pescarus, Tuleu gras, Andreea, Tuleu timpuriu, Renclod Althan, Diana, Alina, Minerva, Alutus and Silvia.

Homogenised fruits samples, precisely weighted were placed in distilled water and heated under stirring at 80^{o}C, using a water bath. Then, it was precipitated the protein and separated through filtration. Coloured samples were cleared with animal charcoal. The filtrate was used for nitrate and nitrite determination. Each sample was analyzed in duplicate.

The nitrate dosage was made through spectrophotometric method using phenol-2,4-disulphonic acid in basic medium. It was obtained yellow coloured compounds that have absorption maxima at 420 nm; the intensity of the obtained colour is proportionally with nitrates' concentration from analysed sample.

The nitrites were determined spectrofotometrically, as well, using Griess reagent. This reagent was prepared using sulphanilic acid in acetic medium and α- naphtylamine hydrochloride. The Griess reaction was firstly described in 1879 and due to its simplicity and precision was intensively used for nitrites' determination from biologic samples, water, soils, food (Sun et al., 2003). The measurements of pink formed complex were made at wavelength 520 nm after 20 minutes that colour developed.

The calibration curves for nitrate and nitrite were linear for studied concentration ranges (figures 1, 2).

All the spectrophotometric measurements were performed using VIS spectrophotometer Metertek SP830 Plus.

RESULTS AND DISCUSSION

The results of our investigation are presented in table 1. The nitrate and nitrite levels are expressed as mg/kg fresh weight.

As it can be noticed, nitrate and nitrite contents of strawberries are higher than those recorded for plums (figures 3, 4). There are similar studies developed in our country concerning nitrate content in strawberries and the found nitrate level is lower, about 80 mg/kg (Gherghi et al., 2001).

The obtained data indicate that the 11 analysed plum samples contains nitrates that ranges between 7,85 and 133,49 mg NO_3^-/kg with mean value of 66,37 mg NO_3^- /kg, meanwhile the 4 strawberry samples contains nitrates that are between 120 and 216 mg NO_3^- /kg with mean value 159 mg NO_3^- /kg.

Quantifying the nitrate levels it can be observed:

- At plums:
  - Level under 20 mg NO_3^- /kg at 2 samples (18,18%);
  - Level between 21-60 mg NO_3^- /kg at 4 samples (36,36%);
  - Level between 61-100 mg NO_3^- /kg at 2 samples (18,18%);
  - Level between 101-133,49 mg NO_3^- /kg at 3 samples (27,27%).
- At strawberries:
  - Level under 100 mg NO_3^- /kg at 0 samples;
  - Level between 100-200 mg NO_3^- /kg at 3 samples (75%);
  - Level between 201-250 mg NO_3^-/kg at a single sample (25%).

Regarding nitrite content at analysed fruits, it can be concluded that is a significant difference between the two types of fruits. If in plums the nitrite content fluctuate between 0,86 mg NO_2^-/kg and 1,47mg NO_2^-/kg with an approximate mean value 1,19 mg NO_2^-/kg, at strawberries the inferior found limit is 2,4 mg NO_2^-/kg and the superior one is 4,08 mg NO_2^- /kg with an approximate mean value 2,94 mg NO_2^-/kg.

Anyway, nitrite contents in vegetal products are generally lower than nitrate ones. The transformation processes of nitrate in plants lead to nitrite and this step is a transitory one because the nitrites are reduced by nitritreductase to nitrogen oxides very rapidly.

According with studied developed by World Health Organization, nitrite levels in food are very low (generally below 10 mg/kg) and extremely rare exceed the value 100 mg/kg. Exceptions to this situation are the vegetal products that were damaged, poorly stored, pickled or fermented ones. In such circumstances it has been found nitrite levels of up to 400 mg/kg (FAO/WHO, 1995).

Also, in the literature are presented extended studies carried out on apples and strawberries and the conclusion of them is that the nitrate and nitrite levels were generally very low, often even below the detection limit (Woese et al., 1997).

CONCLUSIONS

The goal of investigation that we have carried out was to establish the nitrate and nitrite level from plums and strawberries collected from Valcea. The developed researches led to the conclusion that strawberries accumulate more quantities of nitrate and nitrite than plums.

It is known that molybdenum is a component of nitrate reductase enzyme, which has an important role in plant nitrate metabolism (Chairidchai, 2000). Plants' lower concentrations of molybdenum lead to nitrate accumulation in tissues and it is possible that analysed strawberries may have deficiencies in these elements. So, there are necessary further studies concerning this aspect.

Similar studies developed on the same fruits were conducted in other countries and the level of nitrates and nitrites were situated around the same values that we have obtained (Susin et al., 2006). So, it may be concluded that the results of the monitoring were similar to the results of investigations carried out in other countries.

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Tables

Table 1. Nitrate and nitrite contents in plums and strawberries

Sample	Nitrate content (mg/kg fresh weight)	Nitrite content (mg/kg fresh weight)
Pescarus	90,26	1,19
Tuleu gras	15,69	0,94
Andreea	51,02	1,19
Centenar	47,11	1,27
Tuleu timpuriu	54,97	1,27
Renclod Althan	35,31	0,86
Diana	86,39	1,31
Alina	106,03	1,11
Minerva	102,01	1,47
Alutus	133,49	1,35
Silvia	7,85	1,19
Premial	216	2,4
Prundeni	162	2,6
Calina	120	2,68
Magic	138	4,08

Figures

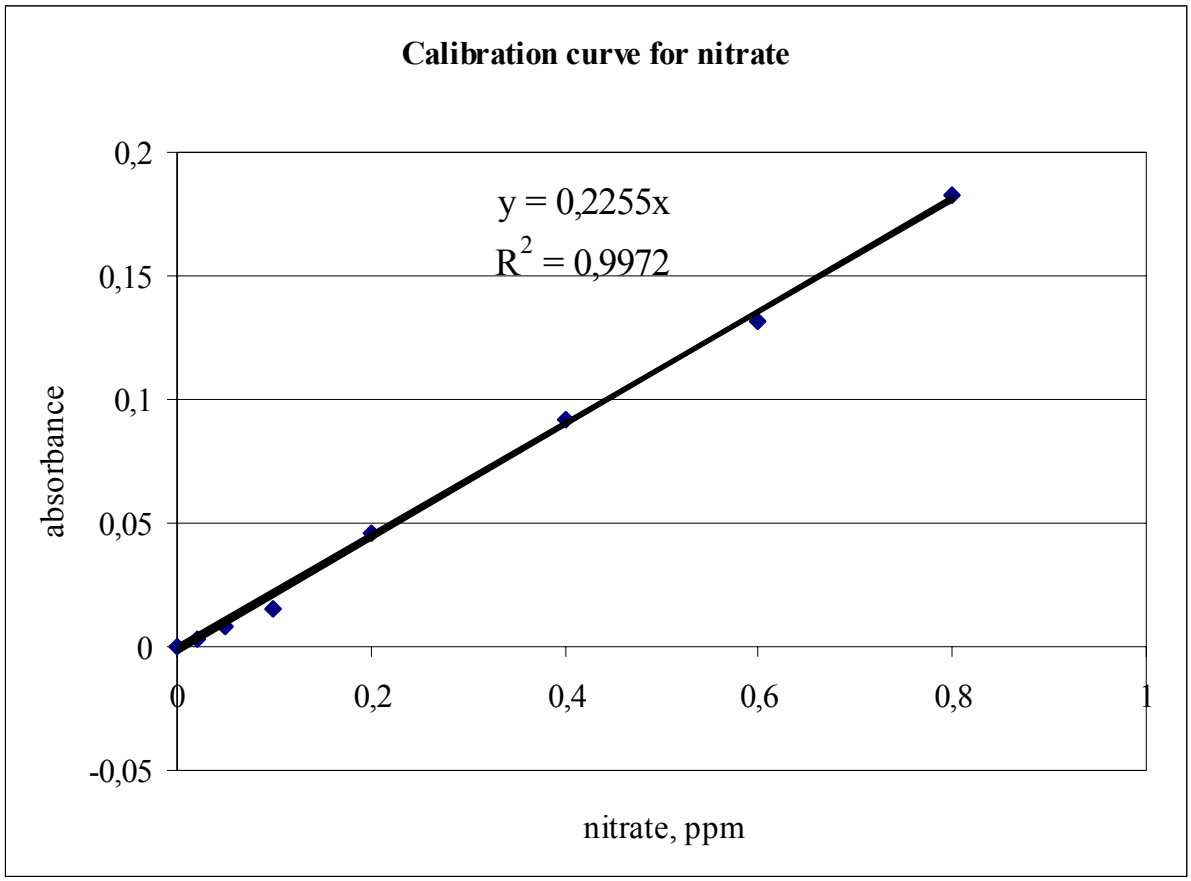

Fig. 1. Calibration curve for nitrate

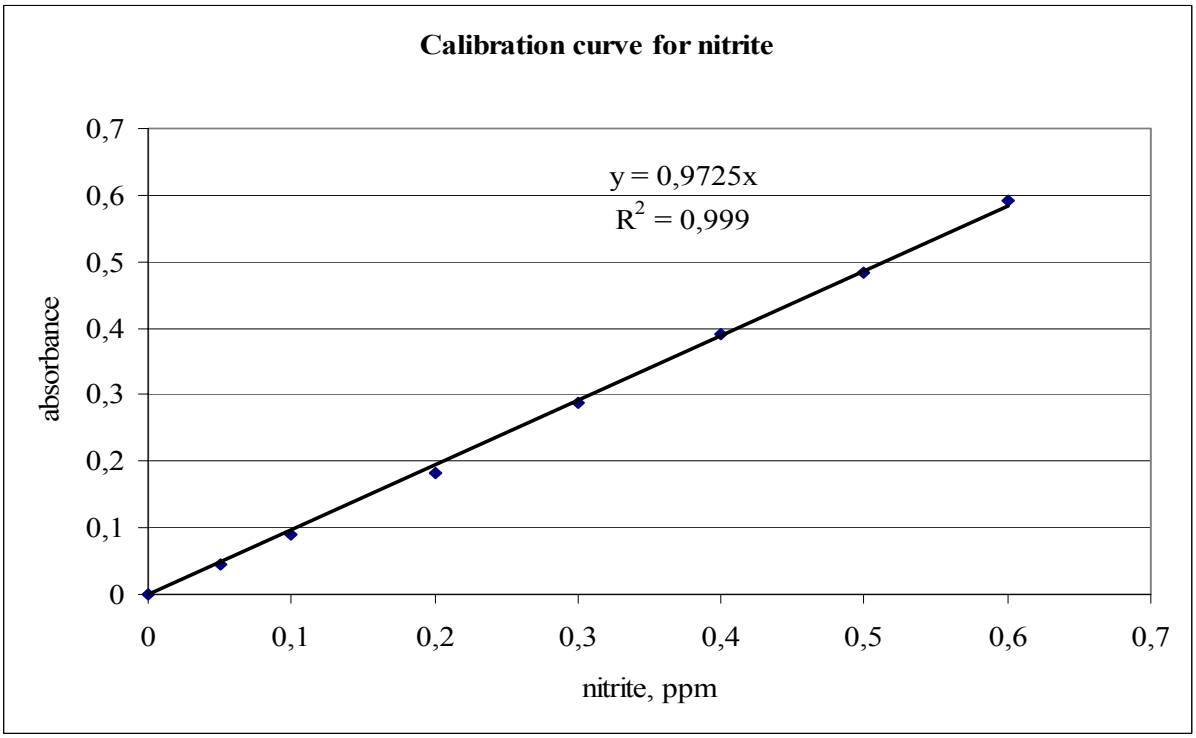

Fig. 2. Calibration curve for nitrite

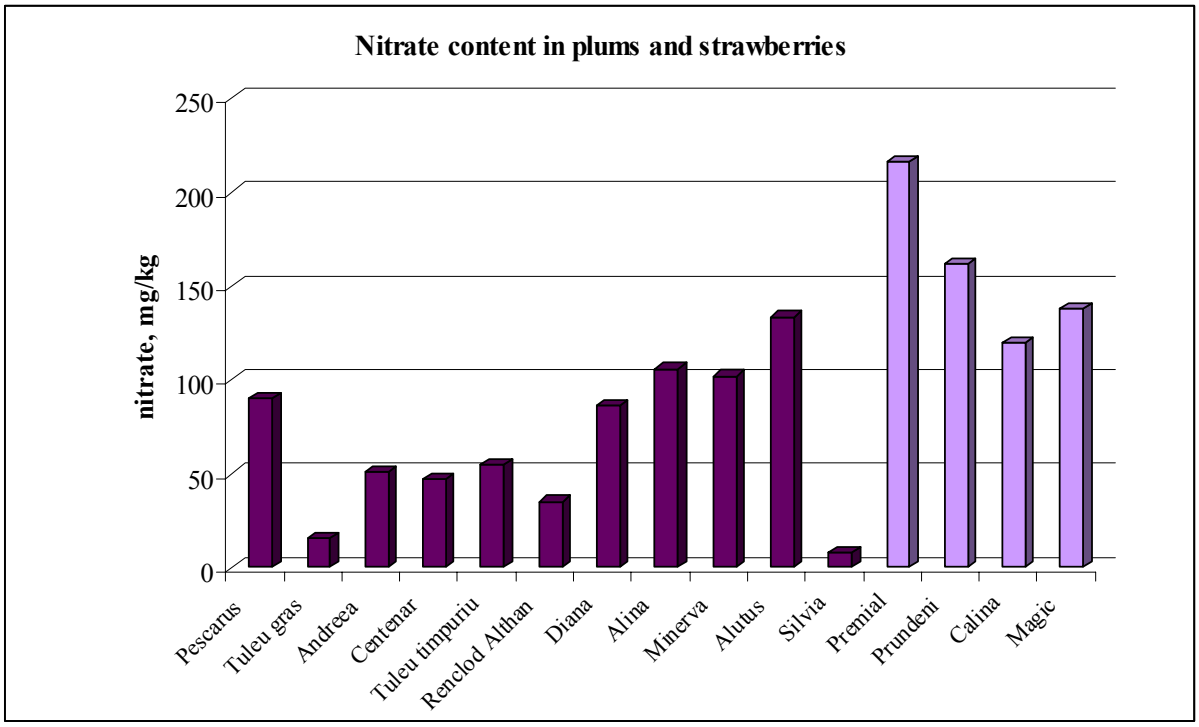

Fig. 3. Comparison between nitrate contents in plums and strawberries

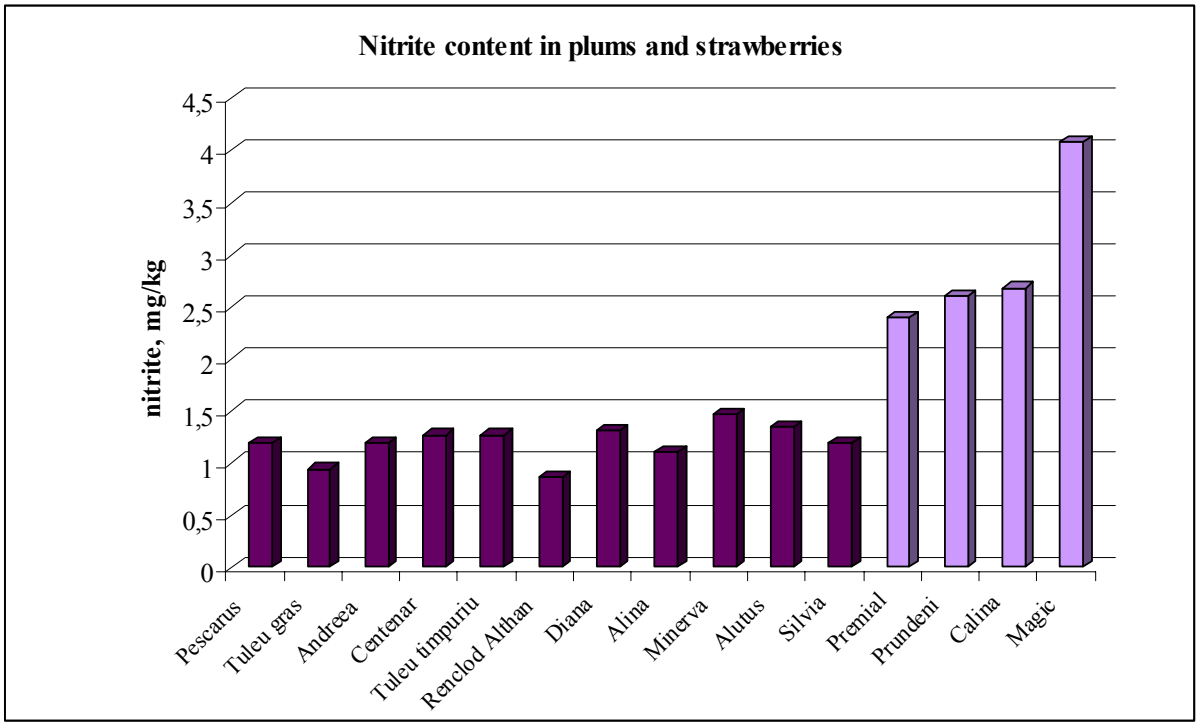

Fig. 4. Comparison between nitrite contents in plums and strawberries

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RESEARCHES CONCERNING THE FRUCTIFICATION EARLINESS OF SOME PEACH HYBRID PROGENIES OF DWARF AND SEMIDWARF OWN ROOTS

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ABSTRACT

Taking into consideration the modern fruit growing requirements, of creating productive low builded varieties, resistant at diseases, pests and which turn account the environment factors. Between 2001-2004, there were carried out experiences at S.C.D.P Bihor, using as biological material the peach varieties Springcrest and Cardinal and a dwarf Bonanza nectarin variety. The experiences show that high earliness fructification have the hybrids progenies obtained from the combination Bonanza x Springcrest. The highest productions on own roots were registered Oradea 14 and Oradea 8.The most valuable variants are recommended as a biological material which might be a base of producing new peach varieties.

INTRODUCTION

The peach, as a fruit species, is cultivated for its fruits, that are used as rough food or by producing of jams, stewed fruits, sweetens etc.

In Bihor, especially in Oradea area, in a limited habitat, the peach trees find together with apricot and almond trees, optimum conditions of growing and development.

The researching programs made by this species follow the modern fruit growing requirements, that means creating of some productive varieties, with a high fruit quality, resistant at diseases and pests and which turn account the environment factors.

Very important aspects are the high density and efficiency of the crop, influenced by the low builded varieties. This means avoiding the costly and difficult works and an efficient use of the environment factors.

The new dwarf and semidwarf genotypes represented the researching material of the S.C.D.P. Oradea. One of the made researches is the behavior of a peach genotypes and dwarf and semidwarf, between 2001-2004, created by dr.ing. Iulian Ştefan.

The aim was the obtaining of low builded trees for intensive plantations, for varied advantages, like the very early fructification.

MATERIALS AND METHODS

The biological material was builded from: two peach varieties (Springcrest and Cardinal); one dwarf nectarin Bonanza variety.

The hybrid progenies of own roots are:

- 13 dwarf and semidwarf peach hybrid progenies from the Bonanza Springcrest hybrid;
- 6 dwarf and semidwarf peach hybrid progenies from the Bonanza x Cardinal hybrid;

The researches were carried out between 2001-2004 and were organized like the randomized blocks' method with three repetitions. Every repetitions was builded from three trees, with a planting distance of 4/1,5 m.

The planting density for the dwarf and semidwarf varieties was 1666 trees/ha and for the standard varieties 833 trees/ha. For some characters, the used Mt was the experiences medium and for others.

During the vegetation, in all researching years, the most important aim was the fructification earliness expressed in fruit kg/tree.

RESULTS AND DISCUSSION

The experimental results concerning the fructification earliness at the researched progenies, which means establishing the moment when the fruit trees start fruit-bearing, as well as the fruit quantity/tree are shown in the following tables.

The fructification earliness at the dwarf and semidwarf peach hybrid which proceeds from the hybrid combination Bonanza x Springcrest is shown in table nr. 1 and

The experimental results analyze concerning fruit production/tree emphasizes that all progenies proceeded from the Bonanza x Springcrest hybrid start fructification from the second year after planting.

- In the second year after planting all progenies start fructification, but these are small (between 0,2 kg/tree – Oradea and 2,07 kg/tree – $Oradea_{14}$). High values $Oradea_{14}$ (2,07 kg/tree), $Oradea_8$ (1,71 kg/tree). The interpopulation variability estimated by the variability coefficient value is generally low at all experienced progenies.

- In the third year after planting, the production has high values at all hybrid progenies (between 1,54 kg) tree $Oradea_4$ and 4,27 kg/tree $Oradea_{14}$) and the medium value is 2,70 kg. Medium high values of the trees production is established at $Oradea_{14}$ (4,27 kg/tree), $Oradea_{13}$ (3,65 kg/tree), $Oradea_6$ (3,51 kg/tree).The interpopulation variability coefficient value is medium and high at the studied progenies.

- In the fourth year after planting, the medium productions are higher than the others from the precedent years. High medium productions were established at $Oradea_8$ (6,83 kg/tree), $Oradea_6$ (6,71 kg/tree), $Oradea_{14}$ (6,37 kg/tree).The interpopulation variability limits were situated between 3,91 kg/tree (Oradea3 and Oradea 8)

- In the fifth year after planting, the production/tree is significant lower. Higher values than the medium production established $Oradea_1$ (5,26 kg/tree, $Oradea_2$ (4,18 kg/tree), $Oradea_3$ (3,84 kg/tree).The interpopulation variability is generally medium.

The fructification earliness of dwarf and semidwarf peach hybrid progenies that proceed from the hybrid combination Bonanza x Cardinal are shown in table nr. 2.

From the given information in table nr.2, it has been ascertained that all seven progenies that proceed from the hybrid Bonanza x Cardinal start fructification in the second year after planting. Comparing to the Bonanza x Springcrest combination, the established values are lower than that.

- In the second year from planting, the production limits are close together (0,13-0,37 kg), the differences between Mt being actually insignificant comparing to the medium.

The highest production/tree was established at $Oradea_6$ (0,37 kg) and the lowest at $Oradea_1$ (0,13 kg). The variability coefficient value (Δ%) is situated between 18-20%.

- In the third year from planting, the production has significant high values, situated between 2,05 kg/tree ($Oradea_6$) and 4,35 kg/tree ($Oradea_7$). The highest values are registered at progenies $Oradea_5$ (3,93 kg/tree), $Oradea_4$ (3,67 kg/tree).

- In the fourth year from planting, there are registered the highest productions and also a significant variability regarding to this character. The variability limits between progenies are situated between 6,51 kg/tree ($Oradea_5$) and 3,04 kg/tree ($Oradea_1$), differences which are significant not only between themselves but also comparing to the variants medium (4,75 kg/tree).

The highest production is established at $Oradea_5$ (6,51 kg/tree), then at $Oradea_4$ (6,16 kg/tree) and $Oradea_3$ (6,07 kg/tree).

- In the fifth year after planting, the fruits production registered a low value, similar to the interpopulation variability.

The variability limits are situated between 1,89 kg/tree ($Oradea_7$) and 3,04 kg/tree ($Oradea_3$) and the Mt values are 2,30 kg/tree.

The interpopulation variability is constant like the previous years.

CONCLUSIONS

The fructification earliness, established by the early fruit-bearing and the fruit production in first after-planting years, was influenced by the hybrid combination and the own roots.

The peach hybrid progenies dwarf and semidwarf own roots start fructification in the second year after planting, having a very early fruit-bearing.

The fruit production in the second year of the peach hybrid progenies dwarf and semidwarf which proceed from the Bonanza x Springcrest hybrid combination is higher (0,81±0, comparing to the Bonanza x Cardinal combination progenies (0,22±0,03).

The highest productions on the own roots varieties were established at $Oradea_{14}$ (2,07 kg/tree) and $Oradea_{8}$ (1,7 kg/tree).

The medium fruit/tree productions registered significant high values in the following years (III-V), having maximum values of 6 kg/tree at $Oradea_{8}$, $Oradea_{6}$ (Bonanza x Springcrest), $Oradea_{5}$, $Oradea_{4}$, $Oradea_{3}$ (Bonanza x Cardinal).

The most valuable variants, having high fructification earliness, are recommended as a biological material which might be a base of producing new peach varieties.

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Table 1

Estimation of fructification earliness for peach hybrid progenies of dwarf and semidwarf type rising from Bonanza x Springcrest hybrid combination on the ground of mean fruit yield/tree (kg) and starting with the second planting year

Number	Hybrid progeny	Experimental year (kg/tree)							
		2001 II		2002 III		2003 IV		2004 V	
		$x \pm s_x$	s%	$x \pm s_x$	s%	$x \pm s_x$	s%	$x \pm s_x$	s%
1.	Oradea 1	0,51±0,08	27,71	2,16±0,24	19,22	5,12±0,83	28,04	5,26±0,98	32,43
2.	Oradea 2	0,24±0,04	29,64	3,21±0,28	15,52	4,46±0,67	25,98	4,18±0,52	21,67
3.	Oradea 3	0,87±0,11	21,87	1,97±0,21	18,44	3,91±0,43	19,02	3,84±0,61	27,14
4.	Oradea 4	0,21±0,03	24,71	1,54±0,19	21,34	4,45±0,58	22,54	3,21±0,35	18,51
5.	Oradea 5	0,90±0,08	15,37	2,35±0,29	22,17	5,56±0,61	18,98	3,07±0,54	30,62
6.	Oradea 6	1,42±0,16	19,49	3,51±0,48	23,67	6,71±0,94	24,23	2,94±0,39	23,45
7.	Oradea 7	0,55±0,07	22,02	2,13±0,32	25,99	4,05±0,69	29,47	3,03±0,51	29,18
8.	Oradea 8	1,71±0,19	18,42	3,24±0,51	27,23	6,83±0,55	14,93	3,45±0,41	20,75
9.	Oradea 9	0,26±0,03	19,94	2,05±0,28	23,63	3,47±0,43	21,81	2,02±0,21	17,39
10.	Oradea 10	0,73±0,12	28,43	3,12±0,37	20,51	3,51±0,62	30,56	1,96±0,17	15,28
11.	Oradea 12	0,31±0,02	11,16	2,41±0,39	27,99	3,34±0,47	24,34	2,51±0,37	25,64
12.	Oradea 13	1,14±0,09	13,65	3,65±0,37	17,53	5,75±1,05	34,89	3,47±0,58	29,03
13.	Oradea 14	2,07±0,18	15,04	4,27±0,58	26,49	6,37±1,18	32,04	3,55±0,39	18,76
Progeny medium (mt)		**0,81±0,15**	**73,50**	**2,70±0,21**	**29,96**	**4,83±0,33**	**25,90**	**3,21±0,23**	**26,86**

Table 2

Estimation of fructification earliness for peach hybrid progenies of dwarf and semidwarf type rising from Bonanza x Springcrest hybrid combination on the ground of mean fruit yield/tree (kg) and starting with the second planting year

Number	Hybrid progeny	Experimental year (kg/tree)							
		2001 II		2002 III		2003 IV		2004 V	
		$x \pm s_x$	s%	$x \pm s_x$	s%	$x \pm s_x$	s%	$x \pm s_x$	s%
1.	Oradea 1	0,13±0,02	26,75	2,62±0,38	25,38	3,04±0,34	19,14	2,07±0,14	11,53
2.	Oradea 2	0,25±0,03	21,09	3,21±0,69	37,26	4,02±0,66	28,57	2,51±0,25	16,59
3.	Oradea 3	0,21±0,03	18,59	3,54±0,58	28,61	6,07±1,18	36,52	3,04±0,41	22,81
4.	Oradea 4	0,26±0,05	31,62	3,67±0,68	32,16	6,16±1,37	38,76	2,46±0,15	17,35
5.	Oradea 5	0,14±0,02	24,71	3,93±0,59	26,31	6,51±1,01	26,89	2,13±0,36	29,76
6.	Oradea 6	0,37±0,05	22,37	2,05±0,22	19,62	3,92±0,66	29,12	2,05±0,38	32,62
7.	Oradea 7	0,18±0,02	19,22	4,35±0,98	39,54	3,53±0,49	24,35	1,89±0,26	23,84
Experience medium (mt)		**0,22±0,03**	**37,66**	**3,33±0,29**	**23,57**	**4,75±0,54**	**30,71**	**2,30±0,15**	**17,06**

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BEHAVIOR OF SOME APRICOT, PEACH AND PLUM SPECIES TOWARDS THE EARLY DISAPPEARING PHENOMENON, IN THE AREA OF ORADEA

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ABSTRACT

The behaviour of some apricot, peach and plum species towards the early disappearing phenomenon had been studied at S.C.D.P. Oradea, between 1993-2007. From the studies that were carried out, researchers came to the conclusion that from all three species, Mamaia (70%) and Litoral(50%) had a high percentage regarding early disappearing, comparing to Sirena and Umberto, that registered a low percentage. In case of peach, especially nectarin, the percentage is about 29-33%. Although the plum is considered resistant species ar climatic conditions, there were some foreign varieties that suffered from early disappearing (Stanley, Anna Spath, Valor).

INTRODUCTION

In the fruit growing practice, an important place takes the long period of time at a high productivity that a plantation should have. This wish may come true only if the orchard maintains its initial density – gaps appearance represents a negative aspect.

In the case of the apricot trees, the early disappearing phenomenon has been studied by many researches: Bunea A. (1981; 1993; 2001), Bodi I. (1967), Prica D. (1968), Rozsnyai Zsuzsa (1981). They discussed this phenomenon depending on the agrobiological, phitopatological and climatic factors, comparing to other causes like drying, which hadn't triggered the researcher's attention yet.

Because the reality shows that early draining leads to a decrease of the fructification earliness, researches considered that it might be helpful to find out the reasons that produce it and the solutions to diminish it.

MATERIALS AND METHODS

The studied biological material is represented by 8 apricot varieties, 11 peach varieties and 7 plum varieties, grafted on mirobolan.

The fruit-trees were planted in 1990 at a distance of 4 meters between rows and 2 m on the row, the soil being

The observations were just about trees drying, the given information was presented in real and relative values, in form of tables.

CLIMATE CONDITIONS

The area surrounding Oradea has an pedoclimatic potential that favours growing and fruit-bearing of all species that are grown-up in our country, having a annual medium temperature of 10,3°C and annual precipitations of 635 mm, with extreme values situated between 9,5 and 11°C and precipitations from 364 mm in 2000 to 870 mm in 1999.

The soil of the plantation has a medium fibber, situated near the Crişul Repede river bank.

RESULTS AND DISCUSSION

The early disappearing of the peach trees, presented in table 1, shows this phenomenon from the first years after planting.

Depending on the variety, trees draining were met at Mamaia variety that after 17 years from planting, disappeared 70%, and followed by Litoral with 50% and Comandor with 45%.

A better situation has the Sirena variety with 3% disappeared trees, Umberto, Silvana and Favorit, which registered a percentage lower than 15-16% disappeared trees.

A separate case is are Umberto and Sirena species that after 3 years disappeared 3-14%, after that the phenomenon disappeared.

Table 2 shows the percentage that peach registered, which is considered a sensitive species. From all 11 studied varieties, all suffered from early disappearing, with a percentage situated between 4 and 38%. The most resistant seemed to be the varieties Superba de Toamna, Southland and Springold (all under 10%), meanwhile Jerseyland, Redhaven and Cardinal had a percentage over 20%.

Table 3 shows the same situation in case of plum trees, where the dried trees percentage is near 40%.

These high percentages must represent a future plan for the researchers to diminish and stop this phenomenon.

Table 1

The early apricot trees disappearing, depending on the variety, Oradea 1990-2007

Nr.	Variety	Planted tree/pieces	Drained trees				Entire drained trees	% drained trees after 17 years
			1993	1996	1999	2006		
1.	Mamaia	10	6	6	7	7	7	70
2.	Litoral	10	2	2	4	5	5	50
3.	Excelsior	10	1	2	3	3	3	30
4.	Comandor	20	0	5	9	9	9	45
5.	Umberto	21	3	3	3	3	3	14
6.	Sirena	32	0	1	1	1	1	3
7.	Silvana	20	2	2	3	3	3	15
8.	Favorit	19	2	2	2	2	3	16

Table 2

The early peach trees disappearing, depending on variety

Nr.	Variety	Planted trees in 1970	Drained trees in the year		Entire drained trees	% drained trees
			2006	2007		
1.	Superbă de Toamnă	26	1	1	1	4
2.	Cardinal	14	3	3	3	21
3.	Flavortop	18	3	5	5	28
4.	Jerseyland	21	8	8	8	38
5.	Redhaven	32	9	9	9	28
6.	Southland	52	1	4	4	8
7.	Veteran	59	2	9	9	15
8.	Jerseyglo	58	5	9	9	16
9.	Collins	37	1	7	7	19
10.	Fantasia	17	2	5	5	29
11.	Springold	48	4	5	5	10

Table 3

The early plum trees disappearing depending on the variety, Oradea 2007

Nr.	Variety	Planted trees in 1990	Drained trees		% dried trees
			2006 2007	Entire	
1.	Anna Späth	28	18 18	18	64
2.	Minerva	2	- -	0	0
3.	Tuleu gras	35	16 17	17	49
4.	Centenar	23	- 2	2	9
5.	Valor	5	1 1	1	20
6.	President	5	2 2	2	40
7.	Stanley	91	34 36	36	40

CONCLUSIONS

Related to the obtained results, researches came to the conclusions that all three species register a high number of dried trees. The apricot is known as very sensitive at apoplexy; but the peach and the plum take part at a drying phenomenon during their existence.

At apricot, the most resistant varieties at draining were Sirena, Umberto, Favorit and Silvana with drained trees situated between 3-16% comparing to Mamaia with 70% drained trees.

At peach, the resistant varieties seemed to be Southland, Superior de Toamnă and Springold, excepting nectarine, with a percentage of 28-29% dried trees and Jerseyland 38%.

Concerning plum, this phenomenon registered high values, even if this is resistant at the conditions of our country.

A very low draining percentage registered the Romanian varieties Minerva and Centenar (0-9%).

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Serological and Genetic Diversity of *Plum Pox* Virus Isolates in Bistrita Area

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Keywords: virus strains, PPV-D, PPV-M, PPV-Rec., plum.

Abstract

***Plum pox virus* (PPV) is considered the most dangerous viral pathogen of stone fruits. While PPV is widespread in Romanian plum orchards and causes serious yield losses, very limited information about the variability of isolates are known. To gain new data about PPV strains occurred in Romanian orchards, we investigated 43 PPV isolates collected from five main plum orchards from Bistrita area. PPV strains were serologically determined by TAS-ELISA using PPV-D and PPV-M specific monoclonal antibodies. Molecular strain typing was performed by IC-RT-PCR targeting three genomic regions corresponding to (Cter)CP, (Cter)NIb / (Nter)CP and CI. RFLP analysis was used to distinguish the two major strains, D and M based on a *Rsa* I polymorphism located in (Cter)CP. All PCR products spanning (Cter)CP and 8 PCR products spanning (Cter)NIb / (Nter)CP were sequenced. All PPV isolates typed as PPV-M by serological analysis and also by molecular differentiation in the genomic region corresponding to (C-ter) CP proved to be recombinants between PPV-D and PPV-M when the molecular analysis were performed in NIb/CP region. The sequencing results revealed a high homology with different sequences of PPV recombinant (PPV-Rec) previously reported. All these recombinant isolates share the same recombination breakpoint and conserve the DAG motif, which is considered essential for potyvirus aphid transmission. This genetic similarity confirms that PPV-Rec may represent an ancestral group with a common evolutionary origin. This report of naturally infected plum trees with PPV-Rec strain in Bistrita area predicted it widespread in the other Romanian areas where plum is growing.**

INTRODUCTION

Plum pox virus (PPV) or Sharka is considered one of the most devastating diseases of stone fruits. The virus is very detrimental because it reduces the quality of fruits and causes premature dropping (Dunez and Sutic, 1988, Nemeth, 1994). Therefore, PPV is considered one of the significant limiting factors for a profitable plum growing (Stoev et. al., 2004). Sharka is originated from Eastern Europe and was described for the first time around 1915 in Bulgaria (Atanasoff, 1932). Since then, the disease has progressively spread to a large part of the European continent, around the Mediterranean basin and near Middle East. Also, it has been found in India and America (Chile, USA, Canada). In Romania, Sharka is spread in all plum growing areas causing serious yield losses especially on sensitive cultivars (Minoiu, 1997, Zagrai et al, 2001).

The virus strains identification is a basic condition in effective management and/or control of virus spreading (James and Varga, 2004). For breeding programmes and epidemiological studies on a virus, it is important to know the distribution of its strains on

each country level (Pasquini and Barba, 1994). Despite of this importance, the information about the occurrence and spread of different PPV strains in Romania are extremely limited.

Some PPV isolates can be biologically and epidemiologically differentiated (symptomatology, aggressiveness, aphid transmissibility) but an accurate differentiation is achieved by serological and molecular analysis.

To date, six PPV strains have been characterized. Two main groups named PPV-D (Dideron or chlorotic strain) and PPV-M (Marcus or necrotic strain) with a different epidemiological behaviour were serologically established (Kerlan and Dunez, 1976). PPV-D strain was originally isolated from apricot in southeastern France, and is the most common strain of the virus in western Europe. It can also infect plums, peaches and nectarines. This strain is considered a non-epidemic form of Plum pox. PPV-M was originally isolated from peach in northern Greece, and is known as the most common strain of the virus in southern, eastern, and central Europe. It can also infect plums and apricots. This strain is more efficiently transmitted by aphids than PPV-D and is considered the epidemic form of PPV. The differentiation of the two groups can be achieved serologically by specific monoclonal antibody for PPV-D (Cambra et al., 1994) and PPV-M (Boscia et al., 1997). The strains belonging D and M serotypes can also easily be discriminated by *Rsa*I polymorphism in the amplified DNA by the P1-P2 primer pair that allows the production of the 243 bp fragments located at the C-terminus of PPV CP gene (Wetzel et al., 1991a) or by direct IC/RT-PCR typing using PD and PM specific oligonucleotides (Olmos et al., 1997).

Recombination is considered to play an important role in RNA virus evolution and it is known to be a major source of variation with unpredictable effects on virus pathogenicity (Worobey and Holmes, 1999; Chare and Holmes, 2006). A third major group including isolates resulted from recombination event between PPV-D and PPV-M was identified and called PPV-Rec. This natural recombinant was detected in Albania, Bulgaria, Czech Republic, Germany, Hungary and Slovakia (Glasa et al, 2002, 2004). Two additional minor PPV groups are represented by geographically limited strains El Amar (PPV-EA) originally isolated from Egipt (Wetzel et al., 1991b) and Cherry (PPV-C) isolated from sour cherry in Moldavia (Kalashyan et al., 1994) and from sweet cherry in southern Italy (Crescenzi et al., 1996) and Romania (Maxim et al, 2002).

The newest PPV strain is Winona (PPV-W) which has been found in Canada (James & varga, 2004). PPV-W is genetically distinct from all recognized strains of PPV (James & Varga, 2005).

The objective of our study was to gain new data about PPV strains occurred in an important plum growing area from Romania, such as Bistrita area.

MATERIALS AND METHODS

PPV Isolates. Fourty-three PPV isolates were collected from five main plum orchards from Bistrita area. Sampling was initially based on typical PPV symptoms and virus infection was confirmed by serological and molecular diagnosis.

Serological and molecular diagnosis. Serological diagnosis were performed by DAS-ELISA (Double Antibody Sandwich-Enzyme Linked Immunosorbent Assay) - Clark and Adams (1977), using polyclonal antibodies according to the manufacturer's instructions (Bioreba). Molecular detection was performed by IC-RT-PCR (Immunocapture-Reverse Transcription-Polymerase Chain Reaction) using the pair of primers P1/P2. PPV immunocapture was trapped with PPV polyclonal antibodies (Bioreba). Qiagen One Step kit was used for RT-PCR. The thermal cycling scheme used for amplification was the following: RT - 30 min at 50^{o} C, denaturation / RT inactivation - 2 min at 94^{o} C followed by 35 cycles: template denaturation - 30 s at 94^{o} C, primer annealing - 45 s at 61^{o} C and DNA elongation - 60 s at 72^{o} C. Following to the last cycle, amplified DNA was elongated for 10 min at 72^{o} C. An aliquot of the amplified products (10µl) was fractionated onto 1.5 % agarose gel

electrophoresis in 1 x TBE buffer. Bands were visualized by ethidium-bromide staining under UV light.

Strain differentiation. In order to identify the serotype of the studied PPV isolates, serological tests were made by TAS (Triple Antibody Sandwich) - ELISA using the PPV-D and PPV-M specific monoclonal antibodies provided by Durviz, Spain. Serological differentiation was performed according to Cambra et al. (2004).

Molecular strain typing was done by IC-RT-PCR targeting three genomic regions corresponding to: the first (Cter) CP, using specific primers PD and PM that distinguish the two major PPV strains D and M; the second (Cter) NIb – (Nter)CP, using the pair primer mD5/mM3 (Subr et al., 2004) that detect directly a natural recombinant Plum pox virus (PPV-Rec) between D and M previously reported (Glasa et al., 2002, 2004); the third CI, using CIf/ CID or CIM primer sets (Glasa et al., 2002) to confirm the presence of PPV-Rec. Aliquots of PCR products corresponding to (Cter) CP were subjected to RFLP (Restriction Fragment Length Polymorphism) analysis in order to distinguish the D and M strains based on *Rsa* I polymorphism located in this genomic section. To confirm the molecular variability of the sampled PPV, amplified DNAs were previously purified by Wizard SV Gel and PCR Clean-Up System (Promega) and then sequenced using the BigDye Terminator v3.1 Cycle Sequencing Kit (Applied Biosystems). The samples were run on the ABI Prism 310 Genetic Analyzer (Applied Biosystems). The alignment of nucleotides from all PCR products corresponding to (Cter)CP and eight amplified fragments spanning (Cter) NIb – (Nter)CP region was performed by BioEdit package version 5.0.9 (Hall, 1999). Subsequently, the sequences were compared with those available in NCBI Data Base and Gene Bank.

RESULTS AND DISCUSSION

The differentiation of PPV isolates established by TAS-ELISA using D and M monoclonal antibodies and by IC-RT-PCR using PD and PM specific primers was analogical (table 1). All isolates reacted positively to at least one of the two monoclonal antibody as well as PPV-D or/and PPV-M specific primers. Using TAS-ELISA, from 43 isolates tested, 21 (48.8%) were identified as PPV-D, 17 (39.6%) as PPV-M and 5 (11.6%) revealed the presence of a mixed infection involving D and M strains. The IC-RT-PCR analyses confirmed PPV-D at 20 isolates and PPV-M at 15 isolates. Unlike TAS-ELISA, IC-RT-PCR detected 3 more mixed infection. RFLP analysis confirmed these results by the presence of the *Rsa* I polymorphism in PPV-D strain.

The phylogenetic grouping of PPV isolates based on nucleotide sequences corresponding to C-terminus of PPV coat protein confirmed the high splitting of the two major groups D and M in this genomic section (Figure 1). Our PPV sequences are identical 98-100 % with sequences from NCBI Data Base.

Using the pair of primers mD5/mM3 we observed that all PPV isolates typed as PPV-M in (Cter)CP region were identified as PPV-Rec in (Cter) NIb – (Nter)CP region. Using specific primers to distinguish the two strains D and M in CI region we detected only fragments belonging to PPV-D. That confirmed the presence of PPV-recombinant (Table 2).

To check if the recombination breakpoint position suspected to occur in (C-ter)NIb - (N-ter)CP region corresponds with those PPV-Rec previously reported by Glasa et al (2002, 2004), eight PCR products spanning this genomic section were sequenced (Figure 2). The multiple alignment indicated that the recombination breakpoint is located in the region corresponding to (C-ter) NIb at the nucleotide position 8450. The DAG motif that is considered as essential for potyvirus aphid transmission is also present in our PPV – Rec. Expectedly this site is located at downstream of the recombination breakpoint. Based on the comparative alignment, the sequencing results revealed a high similarity (98-99%) with different sequences of PPV -Rec previously reported and available in Gene Bank. All these recombinant isolates share the same recombination breakpoint.

The serological and molecular typing of PPV isolates from north-east of Transylvania revealed an easily predominant of PPV-D, followed by PPV-Rec strain which is identical serologic with necrotic strain (PPV-M). In this plum growing area, an important frequency has also mixed infection (D+Rec), which may generate the other genetic variations by recombination.

This report of naturally infected plum trees with PPV-Rec strain in Romania predicted it widespread in other areas where plum is growing.

CONCLUSIONS

- All PPV isolates typed as PPV-M in CP proved to be PPV-Rec.
- In Bistrita area, the prevalent strain is PPV-D, followed by PPV-Rec. Mixed infection with D and Rec strains has also an important frequency.
- The genetic similarity with the others PPV-Rec previously described suggesting a common evolutionary origin.
- Our results predicted a widespread of PPV-Rec in the other Romanian areas where plum is growing.

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Tables

Table 1. Serological and molecular differentiation of PPV isolates selected from five plots of Bistrita area - Romania

Plot no.	DAS / TAS-ELISA test (OD=405nm)				IC-RT-PCR (P1/P2 and P1/PD or PM)				RFLP *Rsa* I		
	PPV poly	PPV-D	PPV-M	PPV D +M	PPV poly	PPV-D	PPV-M	PPV D+M	PPV-D	PPV-M	PPV D+M
Plot 1	**10**	**6**	**2**	**2**	**10**	**6**	**2**	**2**	**6**	**2**	**2**
Plot 2	**10**	**3**	**7**	**0**	**10**	**3**	**7**	**0**	**3**	**7**	**0**
Plot 3	**10**	**4**	**5**	**1**	**10**	**4**	**4**	**2**	**4**	**4**	**2**
Plot 4	**10**	**7**	**3**	**0**	**10**	**7**	**2**	**1**	**7**	**2**	**1**
Plot 5	**3**	**1**	**0**	**2**	**3**	**0**	**0**	**3**	**0**	**0**	**3**
TOTAL (%)	**43 (100)**	**21 (48,8)**	**17 (39,6)**	**5 (11,6)**	**43 (100)**	**20 (46,5)**	**15 (34,9)**	**8 (18,6)**	**20 (46,5)**	**15 (34,9)**	**8 (18,6)**

Table 2. Results of serologic and molecular typing based on different target region of PPV isolates selected from five plots of Bistrita area – Romania

Plots no.	Isolate	PPV strain identified by			
		TAS-ELISA	IC-RT-PCR		
			(C-ter) CP P1-PD/PM	(C-ter) NIb / (N-ter) CP * mD5/mM3	CI Cif – CID/CIM
1	Bistriţa 1	D	D	-	D
	Bistriţa 2	D	D	-	D
	Bistriţa 3	D	D	-	D
	Bistriţa 4	D+M	D+M	Rec	D
	Bistriţa 5	M	M	Rec	D
	Bistriţa 6	D	D	-	D
	Bistriţa 7	D	D	-	D
	Bistriţa 8	D	D	-	D
	Bistriţa 9	D+M	D+M	Rec	D
	Bistriţa 10	M	M	Rec	D
2	Bistrita 11	M	M	Rec	D
	Bistrita 12	D	D	-	D
	Bistrita 13	M	M	Rec	D
	Bistrita 14	M	M	Rec	D
	Bistrita 15	M	M	Rec	D
	Bistrita 16	D	D	-	D
	Bistrita 17	M	M	Rec	D
	Bistrita 18	M	M	Rec	D
	Bistrita 19	M	M	Rec	D
	Bistrita 20	D	D	-	D
3	Dumitra 1	D	D	-	D
	Dumitra 2	M	M	Rec	D
	Dumitra 3	M	M	Rec	D
	Dumitra 4	D	D	-	D
	Dumitra 5	M	M	Rec	D
	Dumitra 6	D+M	D+M	Rec	D
	Dumitra 7	D	D	-	D
	Dumitra 8	M	M	Rec	D
	Dumitra 9	D	D	-	D
	Dumitra 10	M	D+M	Rec	D
4	Mihăieşti 1	D	D	-	D
	Mihăieşti 2	D	D	-	D
	Mihăieşti 3	M	D+M	Rec	D
	Mihăieşti 4	D	D	-	D
	Mihăieşti 5	D	D	-	D
	Mihăieşti 6	M	M	Rec	D

	Mihăieşti 7	M	M	Rec	D
	Mihăieşti 8	D	D	-	D
	Mihăieşti 9	D	D	-	D
	Mihăieşti 10	D	D	-	D
5	Mititei 1	D+M	D+M	Rec	D
	Mititei 2	D	D+M	Rec	D
	Mititei 3	D+M	D+M	Rec	D

* only the isolates identified as PPV-M in (C-ter)CP were tested

Figures

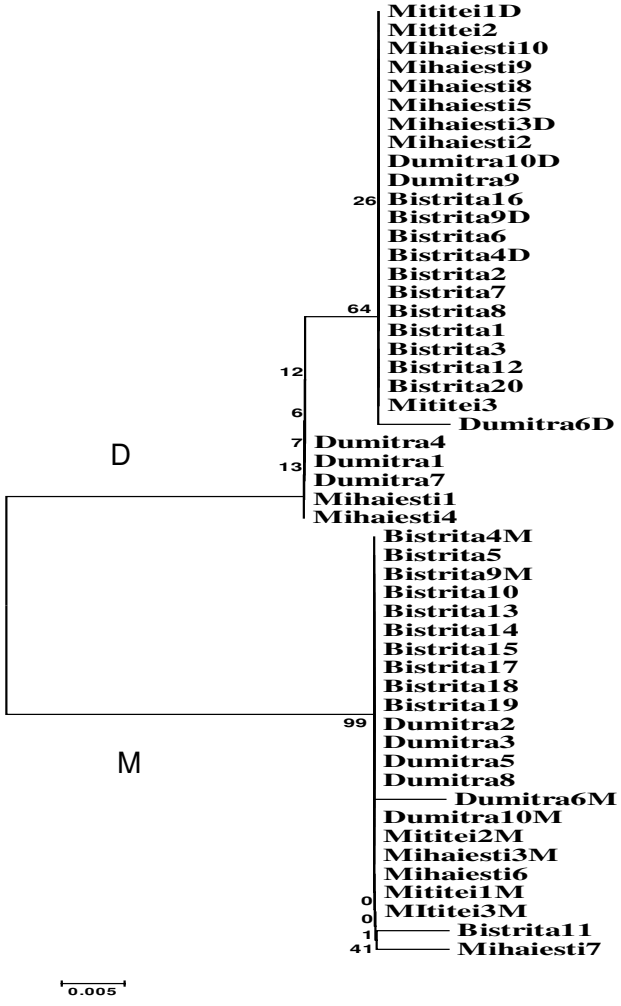


Figure 1. The phylogenetic grouping of PPV isolates based on nucleotide sequences corresponding to C-terminus of PPV coat protein. The isolates mark with D respectively M represent mixed infection and they were sequenced both for PPV-D and PPV-M

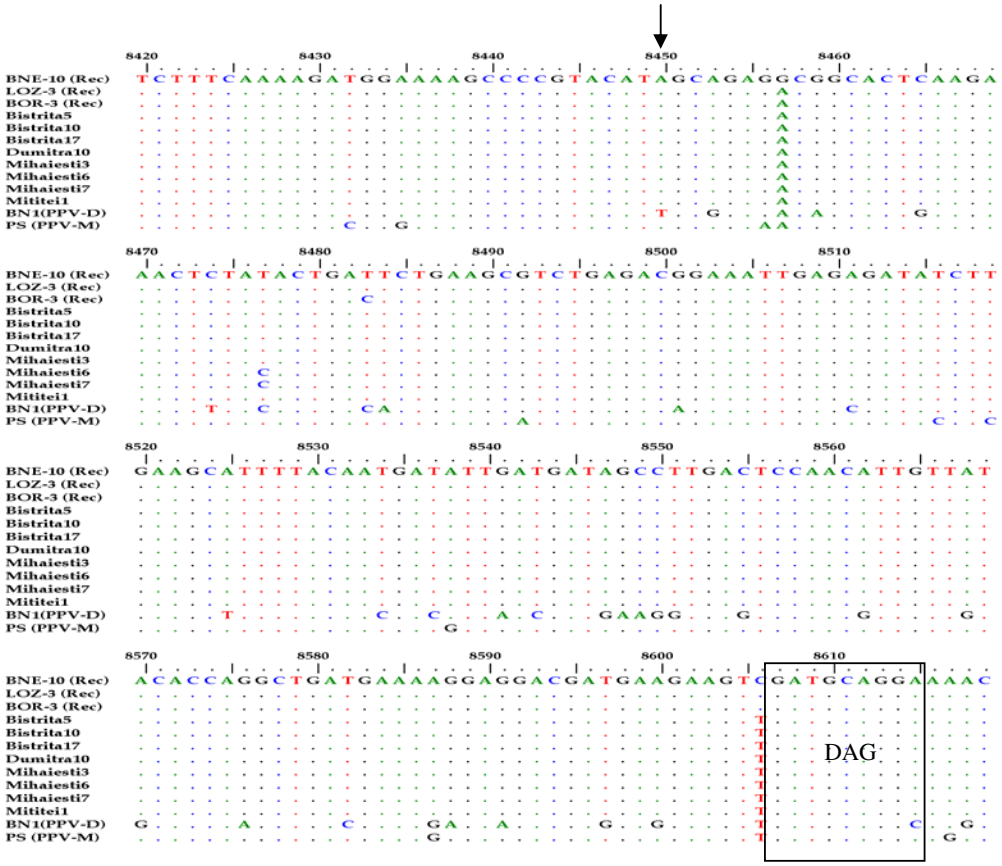
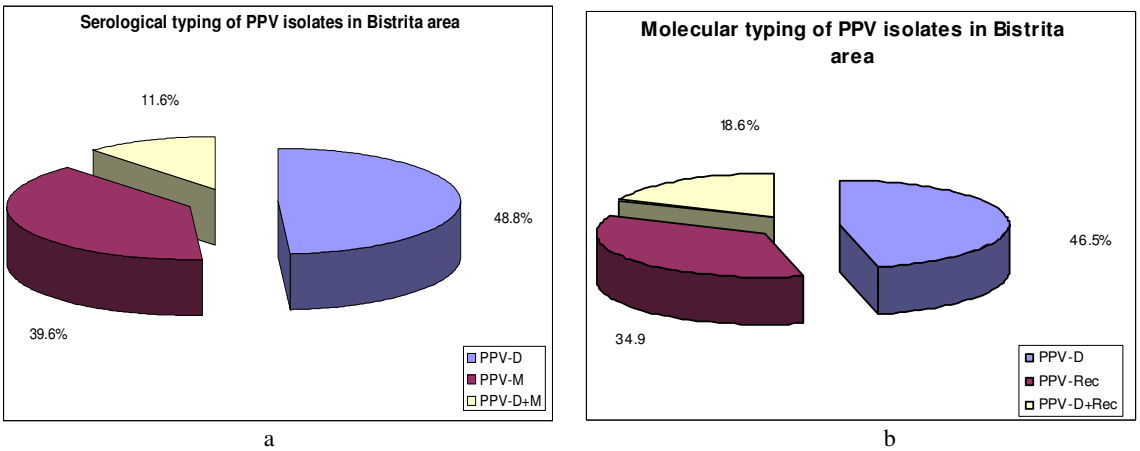


Figure 2. Multiple alignment of recombinant sequences (NIb/CP) of eight Romanian isolates (Bistrita 5, Bistrita 10, Bistrita 17, Dumitra 10, Mihaiesti 3, Mihaiesti 6, Mihaiesti 7, Mititei 1) and three isolates (BNE-10, LOZ-3, BOR–3) previously reported.



a b

Figure 3. The serological and molecular typing of PPV isolates in Bistrita area.

a - serological typing; b - molecular typing.

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VITICULTURE & OENOLOGY

RIPENESS EVALUATION OF THE GRAPES FOR RED WINES BY SENSORY ANALYSIS

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Keywords: ripeness, maturity, harvest, grape sensory analysis

ABSTRACT

A sensory analysis methodology for the evaluation of the black grapes harvesting time is proposed and exemplified. The methodology involves the assessment of 21 sensory parameters of skin, flash and seeds, on a specially designed score sheet. The analysis requires, in accordance with the type of the evaluated parameter, marking the sensory impression on continuous scales from 1 to 5 or on discontinuous scales of 3 or 4 boxes, respectively, followed by the conversion of these check marks into numbers. For the desired style of wine to be produced the winemaker is the one who decides the ideal parameters and plots their optimum values on a web-type diagram as a control curve. Then, the ripeness of the grapes is monitored at equal time intervals by sensory analysis and the results are plotted every time over the optimum diagram. When the degree of overlapping of the actual and control diagram is satisfactory, the harvest decision is taken. In order to ensure the success of this methododology and the best quality of the future wine, a rigorous selection of the control parameters values is essential.

INTRODUCTION

Ripeness or maturity is the stage of the continuous process of grape ripening or development which is chosen by the winemaker as the moment when the harvesting should be started.

Depending on the wine style and many other factors, the ideal chemical and physical composition of the grape varies, so that the term *ripeness* is relative and prone to subjectivity. Grapes considered perfect by a winemaker for a certain purpose may be considered totally unacceptable for another.

Ripeness is often linked to the sugar concentration in the grape. The reason is that the sugar concentration is directly related to the potential alcohol content of the future wine, thus having a major impact on the wine type and style.

However, sugar concentration is not the only parameter of the grape that is important when defining the ripeness. Especially in cooler regions, the ripeness of the grapes can be equally evaluated by measuring the acidity of the juice (the pH). The acidity of the juice decreases during the process of ripening; the acceptable level for starting the harvest is also decided by the winemaker in accordance with the style of wine he intents to produce.

Generally, worldwide, the most common parameters monitored in order to establish the ideal harvesting time are the concentration of sugar and the acidity, their evolution curves being somehow in reverse correlation. However, the wine quality is also influenced by the phenolic compounds; therefore, the harvest time should also take into consideration the proper concentration of these compounds. Consequently, for the red wine especially, the measurement of grape phenolics could be very useful. But, the measurement of the phenolic compounds, both anthocyans and tannins, is not as easy to perform as the determination of sugar (by refractometry) or acidity (by titration). The diversity of the phenolic compounds

that may be present in a certain grape variety, their low concentration and the need for advanced separation and measurement techniques, all these factors make the evolution of these compounds difficult to follow.

Even more important and more difficult to determine are the flavour compounds of the grapes, which belong to many classes of substances and are present only in minute concentrations.

For this reason, in order to assess the ripeness as far as the phenolic and flavour compounds are concerned, the sensory analysis of the grape is more and more applied worldwide (Rousseau J. *et al.,* 2003).

The methodology of sensory analysis of the grapes was introduced by Institut Cooperatif du Vin, ICV, France (Rousseau J., Delteil, D., 2000; Delteil D., 2002) with the intention to simplify the procedure of evaluation of the phenolic ripeness (that is the optimum concentration of anthocyans and tannins) and to some extent of the flavour ripeness.

Based on this concept, in this paper a methodology is presented for the assessment of the black grape ripeness and the parameters involved in the decision of harvesting.

MATERIAL AND METHODS

Five black grape varieties (Table 1), harvested on September 15th, 2006 in the collection of the Department of Viticulture and Enology, in Bucharest were evaluated by sensory analysis.

An evaluation sheet was especially designed for the grape sensory analysis, by selecting the most representative parameters and the the most appropriate scales. The sheet is a based on the one designed by Maurice Chassin, CQFDégustation, Tour, and on the sheet prepared at Ecole d'ingénieurs de Changins (Guyot and Dupraz, 2004), but is adapted and modified to fit our requirements.

The evaluation sheet contains 21 parameters of which 1 tactile, 3 visual and 17 taste characteristics. The sensory analysis focusses on all parts of the berry, starting with the pulp and then proceeding on the skins and seeds.

The steps and the evaluation scales involved are the following:

I – *Visual and tactile analysis*: the evaluation of *berry firmness-p_1* (on a scale from 1 to 5, where 1 is soft, 2-4 is elastic in various degrees and 5 is hard), *berry witherness-p_2* (on a scale from 1 to 5, from smooth to whitered), *berry colour hue-p_3* (on a scale from 1 to 5, from green to yellow for white wine grapes and from pink-light red-violet to black for the red wine grapes), the *berry colour homogeneity-p_4* (on a scale from 1 to 5, from spoted to uniform colour);

II – *Taste analysis of the pulp*: the evaluation of the sensation given by *pulp and juice acidity-p_5* (on a scale from 1 to 5, from flat to very acid), *pulp consistency-p_6* (on a scale from 1 to 5, from liquid to crunchy), *pulp and juice viscosity-p_7* (on a scale from 1 to 5, from watery to full-bodied), *pulp and juice sweetness-p_8* (on a scale from 1 to 5, from neutral to sweet), *pulp and juice aroma-p_9*, (1-vegetal, 2-fresh fruit, 3-ripen fruit, 4-overripen fruit);

III – *Taste analysis of the skin*: the evaluation of the *skin thickness-p_{10}* (on a scale from 1 to 5, from thin to thick), *skin astringency intensity-p_{11}* (on a scale from 1 to 5, from neutral to very astringent), *skin astringency quality-p_{12}* (1-dry sensation, 2-green, herbaceous, 3-well structured), *skin aroma-p_{13}* (1-vegetal, 2-fresh fruit, 3-ripen fruit, 4-overripen fruit), *skin bitterness-p_{14}* (on a scale from 1 to 5, from neutral to very bitter);

IV – *Taste analysis of the seeds*: the evaluation of the *seed colour hue-p_{15}* (on a scale from 1 to 5, from green to brown), *seed colour homogeneity-p_{16}* (on a scale from 1 to 5, from spotted to uniform colour), *seed astringency intensity-p_{17}* (on a scale from 1 to 5, from neutral to very astringent), *seed bitterness-p_{18}* (on a scale from 1 to 5, from neutral to very bitter),

seed consistency-p_{19} (on a scale from 1 to 5, from soft to hard), *seed astringency quality-p_{20}* (1-dry sensation, 2-green, herbaceous, 3-well structured), *seed aroma-p_{21}* (1- herbaceous, 2-green walnut, 3-dry fruits).

RESULTS AND DISCUSSIONS

The results obtained following the sensory analysis of the grapes of the 5 varieties selected for the study are presented in Table 1 as averages of 7 values given by the tasters and their standard deviation. In order to give the winemaker the possibility to decide the appropriate date to start the harvest, in the same table is included a set of parameters considered optimal by the author for a typical quality dry red wine.

To facilitate the interpretation, the results are plotted in web-type diagrams, comprising the control diagram based on the ideal parameters for a red wine on which the diagram of the actual parameters is overlapped.

In Figure 1 the plots for all the five studied cultivars are presented. On the basis of these plots, the stage of the ripeness could be approximated for each variety.

Thus, the Cabernet Sauvignon, of all the studied varieties, needs the longest time to become fit for harvesting. At the date of the analysis, the variety did not reach the physiological ripeness, having the highest acidity (p_5) and the lowest sugar concentration (p_8) of all the studied grapes. The colour seemed well developed, but there is still room for improvement (p_3-p_4). In the author's opinion, the variety needs at least another 4 weeks until it becomes suitable for quality wine production.

Cadarca has still some anthocyanic pigments to accumulate (p_3-p_4), but physiological ripeness is already attained, with sugar (p_8) and aroma (p_9) at levels around the expected ones. The skin is the thinnest of all the evaluated varieties (p_{10}), reason to expect a red wine less coloured then for the other varieties. Although in Bucharest this variety has ripened faster than in the regions of higher latitude where it is usually cultivated, waiting another week or so would also lead to a better balance of the tannins in the grapes.

Feteasca neagra, according to the sensory analysis, at this date appeared to be at its maximum as far as the colour is concerned (p_3-p_4). Although the tannin concentration, which usually follows the same evolution with the anthocyans, is low (p_{11}-p_{14}), this is typical for this variety. The acidity of the pulp and juice is low (p_5), sweetness (p_8) and aroma (p_9) have values similar with the desirable ones, but the pulp consistency and viscosity (p_6-p_7) are higher than ideal for a good yield at mild pressing. With the risk of losing some more acidity, it is recommended to wait at least one week more before harvesting.

For Merlot we can see that the berries are still firm (p_1), while sugar concentration (p_8) and aroma perceived in the pulp (p_9) are both under the desired values, suggesting that one should wait another 2 or 3 weeks before starting the harvest. The phenolic ripeness is, however, very close, the grape revealing a good accumulation of anthocyans (p_3-p_4) and tannins (p_{10}-p_{11}) in the skins. On the other hand, the seeds do not seem ripened yet (p_{15}-p_{16}), but they do have the tannic load expected.

Finally, the Pinot noir, although an early variety, is also not ready to be harvested. It has the pulp consistency and viscosity over the accepted limit (p_6-p_7), a berry firmness of 4 comparing to an ideal value of 2 (p_1) and a lighter colour (p_3-p_4) then expected. The sugar (p_8) and aroma (p_9) seem already accumulated in reasonable concentrations the juice. Tannins in the skins (p_{10}-p_{11}) and in the seeds (p_{15}-p_{16}) are, as are the anthocyans, under the ideal values. Since this variety is known for a good accumulation of tannins, the results suggest the variety should be allowed more time for ripening.

CONCLUSIONS

At the date of this analysis none of the five black grape varieties was ready to be harvested, but the methodology gave us a good evaluation of the stage of maturity they had reached. According to the results, it was possible to estimate the time still needed for the physiological and phenolic ripeness of the studied varieties.

Obviously, the analysis should be performed again after a week, so that the estimated periods before harvesting could be confirmed or redefined. The analysis is to be continued periodically until the actual harvest time of each variety.

This methodology proves to be a useful tool for the ripeness evaluation, especially for the phenolic one. Although sensory evaluation is a reliable tool, for the physiological ripeness determination the physico-chemical measurements of sugar and acidity accumulated in the juice should also be performed.

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Table 1. Results of grape sensory analysis for 5 black wine varieties: average marks awarded by 7 tasters and their standard deviations

Evaluation type	Parameter	Maximum obtainable value	Desirable parameter (Control)	Grape variety				
				Cabernet Sauvignon	Cadarcă	Feteasca neagră	Pinot noir	Merlot
Tactile	p_1. *berry firmness*	**5.0**	2.0	3.57 ± 0.54	1.98 ± 0.60	3.36 ± 0.73	4.48 ± 0.45	3.21 ± 0.81
Visual	p_2. *berry witherness*	**5.0**	4.0	2.00 ± 1.00	3.76 ± 0.48	1.48 ± 0.60	4.00 ± 1.14	1.33 ± 0.50
	p_3. *berry colour hue*	**5.0**	4.5	4.00 ± 0.00	3.52 ± 1.21	4.28 ± 0.44	3.65 ± 0.47	4.11 ± 0.33
	p_4. *berry colour homogeneity*	**5.0**	5.0	4.43 ± 0.54	3.86 ± 0.55	4.83 ± 0.35	3.55 ± 0.64	4.94 ± 0.17
Taste	p_5. *pulp and juice acidity*	**5.0**	2.5	4.29 ± 0.49	2.34 ± 0.88	2.16 ± 0.61	2.18 ± 0.43	2.11 ± 1.05
	p_6. *pulp consistency*	**5.0**	2.0	3.00 ± 1.00	2.44 ± 1.05	2.91 ± 0.73	3.67 ± 0.70	2.87 ± 0.75
	p_7. *pulp and juice viscosity*	**5.0**	2.0	2.57 ± 0.98	2.06 ± 0.56	3.17 ± 1.23	3.75 ± 0.77	2.37 ± 1.31
	p_8. *pulp and juice sweetness*	**5.0**	4.0	2.29 ± 1.11	3.66 ± 0.76	3.99 ± 0.83	3.97 ± 0.60	2.81 ± 1.30
	p_9. *pulp and juice aroma*	**4.0**	3.0	1.29 ± 0.49	3.00 ± 0.71	2.56 ± 0.73	3.00 ± 0.00	1.89 ± 0.60
	p_{10}. *skin thickness*	**5.0**	4.0	3.57 ± 0.54	2.90 ± 1.14	3.20 ± 0.75	4.67 ± 0.61	4.08 ± 0.53
	p_{11}. *skin astringency intensity*	**5.0**	3.5	3.29 ± 0.76	2.46 ± 1.03	1.63 ± 0.46	2.00 ± 1.12	2.68 ± 0.91
	p_{12}. *skin astringency quality*	**3.0**	3.0	2.29 ± 0.49	2.40 ± 0.55	2.50 ± 0.54	1.50 ± 1.00	2.78 ± 0.44
	p_{13}. *skin aroma*	**4.0**	2.0	1.29 ± 0.49	1.80 ± 1.30	1.22 ± 0.44	1.00 ± 0.00	1.44 ± 0.53
	p_{14}. *skin bitterness*	**5.0**	2.0	2.00 ± 1.00	2.00 ± 1.17	1.40 ± 0.46	2.03 ± 0.77	1.44 ± 0.73
	p_{15}. *seed colour hue*	**5.0**	4.5	3.29 ± 0.49	3.26 ± 1.58	3.61 ± 1.27	3.10 ± 0.77	3.00 ± 0.87
	p_{16}. *seeds colour homogeneity*	**5.0**	3.5	2.57 ± 1.27	3.22 ± 1.69	2.99 ± 1.71	2.53 ± 0.73	1.69 ± 0.99
	p_{17}. *seed astringency intensity*	**5.0**	3.0	3.71 ± 0.76	4.02 ± 0.90	4.34 ± 0.96	2.73 ± 0.83	3.23 ± 1.20
	p_{18}. *seed bitterness*	**5.0**	3.5	4.43 ± 0.79	4.22 ± 0.91	3.53 ± 1.19	3.83 ± 0.52	3.24 ± 1.66
	p_{19}. *seed consistency*	**5.0**	4.5	4.43 ± 0.54	4.26 ± 0.75	4.61 ± 0.44	4.83 ± 0.26	4.53 ± 0.47
	p_{20}. *seed astringency quality*	**3.0**	2.0	1.86 ± 0.90	1.20 ± 0.45	1.67 ± 1.00	1.33 ± 0.82	1.89 ± 0.78
	p_{21}. *seed aroma*	**3.0**	2.5	1.86 ± 1.07	2.00 ± 1.00	2.22 ± 0.67	1.17 ± 0.41	1.78 ± 0.67

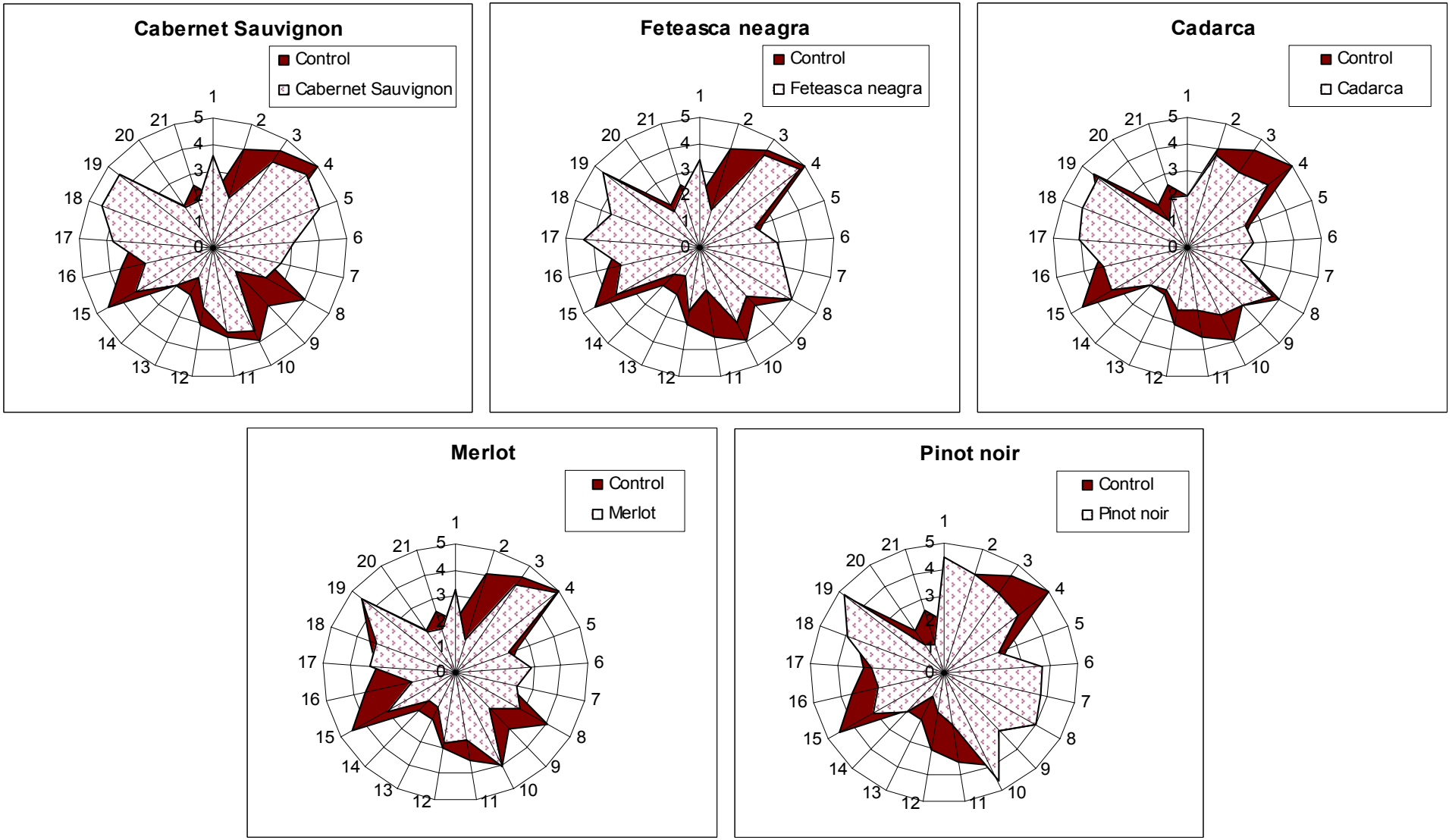

Fig. 1. The radar diagrams for the sensory analysis of the 5 black grapes for red wine production: the solid pattern represents the control diagram (obtained with the desirable/ideal parameters); the dotted pattern represents the actual parameters at September 15th, 2006.

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SENSORY EVALUATION OF RIPENESS OF DORNFELDER AND REGENT GRAPE VARIETIES UNDER THE CLIMATIC CONDITIONS OF SOUTH ROMANIA

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Keywords: Dornfelder, Regent**,** ripeness, maturity, grape sensory analysis

ABSTRACT

Two of the most important crossed German varieties for the red wines cultivated in the collection of the University of Agronomical Sciences and Veterinary Medicine of Bucharest are evaluated regarding their ripeness behaviour under the climatic conditions of South Romania.
The ripeness stage of the two varieties was evaluated at a certain date by sensory analysis of the grapes and compared with other internationally well-known varieties for red wines. The methodology for the sensory evaluation of all the grape parts involves the assessment of 21 sensory characteristics, by filling a specially designed score sheet.
The results for the German varieties were compared with those of the international varieties and also with a proposed standard considered ideal for black grapes which are to be harvested and processed into quality dry red wines.

INTRODUCTION

Dornfelder, also called Weinsberg S 341, is a recent vine grape variety resulting from a Helfensteiner x Heroldrebe cross, one parent being the hybrid cross result of Trollinger and Frühburgunder while the other parent hybrid was the result from crossing Portugieser and Lemberger. Dornfelder is a variety for red wine production, mainly grown in the Rheinhessen and Pfalz regions, but gaining wide popularity in Germany and even in England. In the past years Dornfelder became increasingly available as a bottled varietal wine with aging potential and this is the reason we decided to test the possibility of growing it in Romania. The variety is claimed to have good yield, producing red juice with deep color and pleasant tannin content.

Regent, also named Geilweilerhof 67-198-3 is also a cross with complex parentage of Diana Hamburg x Chambourcin cultivars, one parent being the hybrid cross result of Silvaner x Mueller Thurgau and the other of Seyve Villard 12-417 x Seibel 7053. Although bred for disease resistance, the variety also shows real enological qualities producing good red wines. It is also frost resistant, tolerating temperatures of about -27°C with no protection. The wine is generally of good color, moderate tannins and the fruit aroma/taste profile is described in some reports as reminiscent of Rhone, France red wines.

Both varieties are protected and registered as Vitis vinifera crosses. These varieties were very successful in Germany, leading to wines very well coloured, full-bodied, with plenty of tannin, unlike the usual German black varieties which are typically pale and light-bodied.

Because the climate of Germany is cooler and less sunny than ours it is expected that these varieties will ripen earlier here.

MATERIAL AND METHODS

In order to determine the ripeness stage of the German varieties grown in the collection of the Department of Viticulture and Enology, in Bucharest, on September 15th, 2006 a grape sensory evaluation methodology was used. The methodology consists of the evaluation of a number of sensory parameters of the skins, pulp, juice and seeds, selected and modified by each author based on specific requirements and conditions (Delteil 2002, Guyot and Dupraz, 2004). The actual methodology was detailed in a previous paper (Antoce, 2007) and is based on 21 sensory parameters (*p1-p21*) which are listed in the first column of Table 1.

A number of 7 tasters participated in the evaluation of 5 grape varieties, 3 international (Merlot, Cabernet Sauvignon and Pinot noir) and 2 of German origin (Dornefelder and Regent).

Based on the tasters' experience regarding the black grape varieties cultivated in this part of the country, the parameters that would be desirable for the production of a quality dry red wine were also proposed.

RESULTS AND DISCUSSIONS

The results regarding the sensory parameters are given in Table 1 only for the two German varieties, along with the maximum obtainable value, the desirable parameter for the obtainment of quality red wine and some comments regarding the significance of the evaluated parameter.

The results for the other evaluated varieties are only graphically represented in some diagrams of Figure 1 together with the patterns of the German varieties. The plots are radar-type graphics containing all the sensory parameters, described only by a number, corresponding to the position of the parameter in Table 1 (*p1* = 1, *p2* = 2 and so on).

Actually Figure 1 is a complex diagram containing the plots of sensory parameters of Dornfelder and Regent grapes versus the plots of international varieties (Cabernet Sauvignon, Merlot and Pinot noir) and compared to the standard diagram, based on the desirable parameters from Table 1, describing an ideal configuration for quality dry red wine production. Each diagram contains two fingerprints which overlap, the upper one being of a German variety, while the one underneath is of either an international variety or of the standard.

This complex figure can help us judge the ripeness stage of any of the varieties, allowing us to make comparisons among them or with the standard (expected) fingerprint.

We can notice that, of all the varieties analyzed in the same conditions, Dornfelder and Regent showed the darkest berry colour at this date (colour hue 4.50 and 4.47 respectively, out of maximum 5), confirming their potential for anthocyan accumulation. With the exception of Pinot noir, with the average mark of only 3.65 for hue colour and 3.55 for colour homogeneity, the rest of the studied varieties also displayed good uniformity of the colour.

The acidity is well-balanced in both German varieties (2.26 and 2.47, respectively, out of a maximum 5), already a bit too low in Merlot and Pinot noir (2.11 and 2.18, respectively), but still highly aggressive in Cabernet Sauvignon (4.29).

Pulp consistency (*p6*) and viscosity (*p7*) is similar in all cultivars, with the exception of the Pinot noir, where both parameters are still higher than optimum (3.67 and 3.75 while the optimum is considered 2.00).

As expected, being varieties with early ripening, both Dornfelder and Regent recorded good sugar accumulation, the sweetness of the juice (*p8*) being closest to the sweetness considered ideal for the production of quality dry red wines (3.97 and 4.03, respectively, compared to an optimum of 4.00). Out of the international varieties, only Pinot noir, an early

variety as well, is at the level of physiological ripeness, having also an average mark for sweetness of the juice of 3.97. The parameter for Merlot is 2.81 and for Cabernet 2.29.

All the same, the fresh fruit aroma for Dornfelder and Regent (2.29 and 2.67, respectively) is very close to the value considered by the tasters as optimum for red wines (3.00). Even more, the Pinot noir reached at this date the optimum value of 3.00 for aroma. The skin aroma was considered very similar for all the five cultivars, varying from 1.00 to 1.44, a normal result for non-aromatic grapes. Also, the skin bitterness was judged as being in a close range, varying from 1.44 to 2.03.

According to the results of sensory analysis of the seeds, the phenolic maturity is also attained in Dornfelder, Regent and Pinot noir, as far as the seed colour (*p15-p16*) and consistency (*p19*) are considered, or is very closed, with regard to seed astringency (*p17*), bitterness (*p18*) and quality (*p20*). The Cabernet Sauvignon proves again that it is a variety with later maturity, displaying the highest seed astringency intensity (3.71) and seed bitterness (4.43).

CONCLUSIONS

All things considered, of all the five varieties evaluated the German cultivars and the Pinot noir are the only ones ready to be harvested. At the date of evaluation, these varieties already reached the physiological ripeness and the phenolic maturity.

However, at the same time the Pinot displayed the lowest values for berry hue intensity and berry colour homogeneity, characteristics of this variety which do not improve in time, the wines resulted being notoriously of less intense red colour than typical red wines.

Consequently, the German cultivars can be considered very suitable for cultivation in the South part of Romania, displaying good potential for the obtainment of quality, well-balanced, dry red wines.

The method of grape sensory analysis proves to be very useful not only for the estimation of the ripeness degree of a grape variety at a certain time, but also to evaluate the potential of some new varieties in certain cultivation conditions.

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Table 1. The actual and control parameters for the grapes of Regent and Dornfelder for the production of a typical red wine

Sensorial parameter	Max. obtainable	Actual parameter for D	Actual parameter for R	Desirable parameter (Control)	Observations
p_1. *berry firmness*	5.0	3.41±1.17	4.13±0.67	2.0	the lower the firmness the better the yield under mild pressure conditions which ensure a low extraction of rough tannins
p_2. *berry witherness*	5.0	1.79±0.66	1.67±0.75	4.0	this parameter is related to the water content in the berry, therefore also to the yield and sugar and acidity content
p_3. *berry colour hue*	5.0	4.50±0.96	4.47±0.46	4.5	the berry should be dark blue or black
p_4. *berry colour homogeneity*	5.0	4.69±0.39	4.52±1.00	5.0	the colour must be uniform, without numerous spots
p_5. *pulp and juice acidity*	5.0	2.26±0.89	2.47±1.30	2.5	a better acidity would be desirable for freshness of the wine, but this parameter is not expected to increase anymore
p_6. *pulp consistency*	5.0	2.89±1.25	2.83±1.63	2.0	both parameters are related to the must yield and should be as low as possible for the variety
p_7. *pulp and juice viscosity*	5.0	2.99±1.05	2.65±1.38	2.0	
p_8. *pulp and juice sweetness*	5.0	3.97±0.66	4.03±0.72	4.0	for the overall quality of wine and for a higher alcoholic strength it is desirable to attain a high value
p_9. *pulp and juice aroma*	4.0	2.29±0.76	2.67±0.52	3.0	the aroma profile is consistent with the typical one
p_{10}. *skin thickness*	5.0	3.80±0.56	3.83±1.13	4.0	the thicker the skin the most aroma may be extracted
p_{11}. *skin astringency intensity*	5.0	2.33±1.19	2.20±1.11	3.5	for a good structure of the red wines the level of astringency is expected to be higher
p_{12}. *skin astringency quality*	3.0	2.17±0.98	2.17±0.75	3.0	the quality of astringency is expected to improve during maturation of wine
p_{13}. *skin aroma*	4.0	1.29±0.49	1.17±0.41	2.0	the skin aroma is not too relevant for typical red wines
p_{14}. *skin bitterness*	5.0	1.76±0.42	1.82±1.00	2.0	with the improvement of the skin astringency quality the bitterness will also decrease; in some red wines bitterness is appreciated
p_{15}. *seed colour hue*	5.0	3.37±1.27	4.22±0.59	4.5	the seeds are almost mature, but they will darken further and get more uniformly coloured, the quality of the tannins improving in the same time
p_{16}. *seeds colour homogeneity*	5.0	3.27±1.40	3.42±0.55	3.5	
p_{17}. *seed astringency intensity*	5.0	2.80±1.26	3.30±0.76	3.0	the seed astringency is expected to modify further only slightly
p_{18}. *seed bitterness*	5.0	2.66±1.31	2.80±1.41	3.5	the seed bitterness is already well-balanced, but the seeds will become increasingly dry
p_{19}. *seed consistency*	5.0	4.37±0.71	4.73±0.29	4.5	the seeds are already mature and these parameters are not suppose to change significantly anymore
p_{20}. *seed astringency quality*	3.0	1.83±0.98	1.83±0.75	2.0	
p_{21}. *seed aroma*	3.0	2.00±1.00	1.67±1.03	2.5	

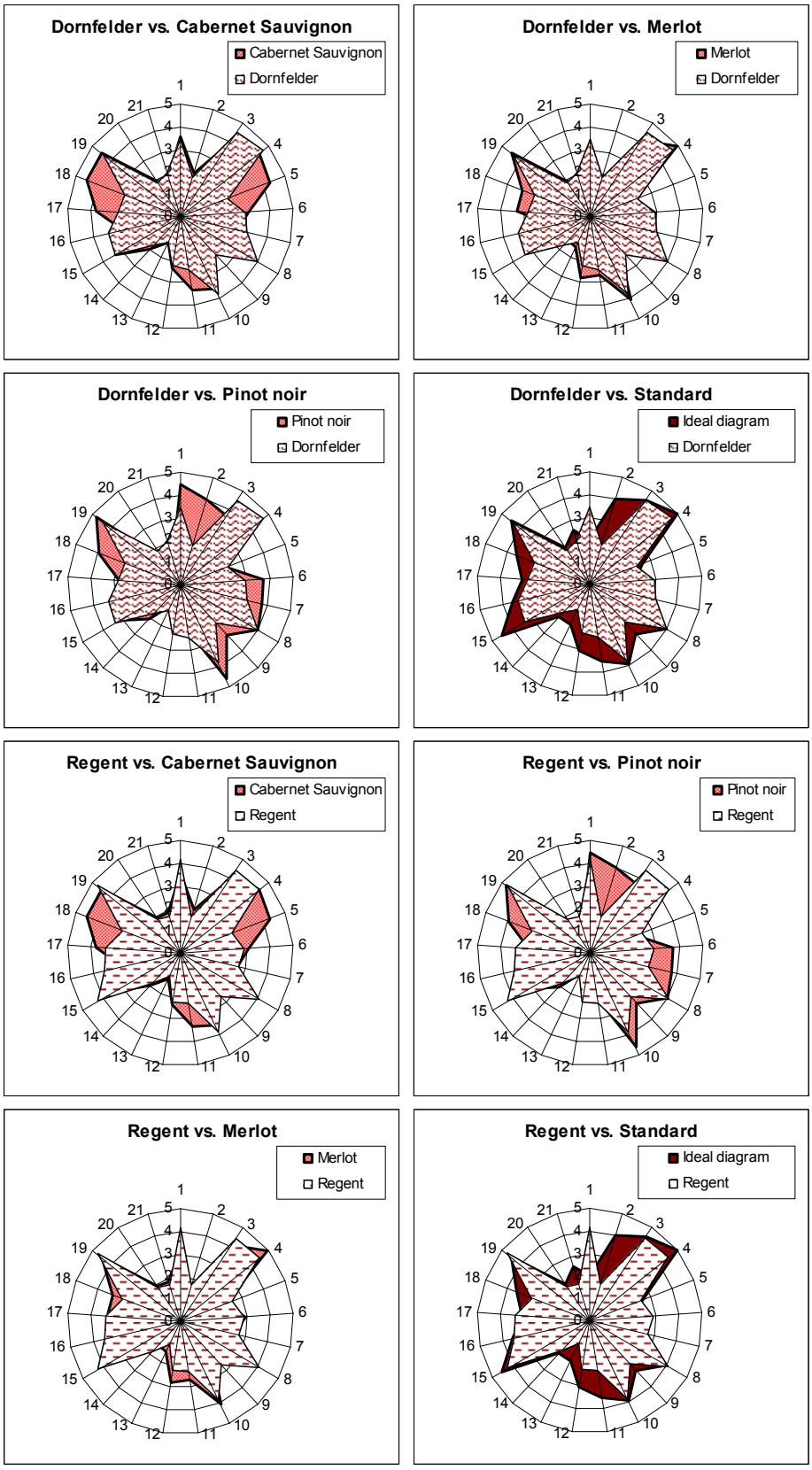

Fig. 1. Plots of sensory parameters of Dornfelder and Regent grapes versus the diagrams of international varieties (Cabernet Sauvignon, Merlot and Pinot noir) obtained at September 15th and versus a standard diagram describing an ideal configuration for quality dry red wine production

Lucrări ştiinţifice U.Ş.M.A.V.B., Seria B, Vol. L, 2007

DIADEGMA SPECIES (HYM.: ICHNEUMONIDAE) WHICH PARASITIZED THE GRAPE LEAF-ROLLER *SPARGANOTHIS PILLERIANA* DEN. ET SCHIFF. (LEP.: TORTRICIDAE) IN SOUTHERN VINEYARDS OF ROMANIA

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Keywords: pest, vine, host larvae, endoparasitoid, parasitism ratio.

ABSTRACT

As a result of the rearing of grape leaf-roller *Sparganothis pilleriana* Den. et Schiff collected in 2000-2003 from two vineyards, Ştefăneşti (Ag) and Dăbuleni (Dj), 6 species of *Diadegma* have been obtained as larval endoparasitoid: *D. contracta* (Brischke)*, D. germanica* Horst.*, D. holopyga* (Thoms.)*, D. laricinella* Strobl.*, D. longicaudata* Horst. şi *D. tenuipes* (Thoms.). *D. germanica* Horst. and *D. tenuipes* (Thoms.). are common in both localities. 6 host-parasitoid relationships have been recorded, all of them new to science. *Diadegma* species preferred the 2nd and 3rd instars of host larvae. The role played by many of these parasitoids in the limitation of grape leaf-roller populations is generally minor, the parasitism ratio being below 0,2%. *Diadegma germanica* Horst. is the most important parasitoid in the both localities, the parasitism ratio being 2,39%.

INTRODUCTION

The genus *Diadegma* consists of a large group of parasitoid hymenoptera (201 species) with a large distribution. Most of them contribute in a significant proportion in the limitation of tortricid populations being used in the biological control programs.

The *Diadegma* species are primary solitary endoparasitoids of immature larvae (Mills and Carl, 1991). They parasitize II - IV larval instars, but some of them prefer the 2nd and 3rd instars of host larvae (Cai and coll., 2005). In France, Voukassovitch (1924) obtained the *D. fenestralis* Holmgr. and *D. armillata* Grav. species as parasitoids of immature larvae *Sparganothis pilleriana* Den. et Schiff. Predescu (1971) has observed that *D. fenestralis* Holmgr. is the main parasitoid of *S. pilleriana* larvae (parasitism ratio 6-15%), in Banat.

MATERIALS AND METHODS

The researches were carried-out in two vineyards of South of Romania, Ştefăneşti-Argeş and Dăbuleni-Dolj. The larvae host collected in May-July period, 2000-2003 years. The caterpillars were reared isolatelly up to the apparition of tortricid or parasitoid adults, their food being the leaves vine. 35 individuals of *Diadegma* species were achieved under laboratory conditions.

RESULTS AND DISCUSSIONS

6 species of *Diadegma* have been obtained as larval endoparasitoid: *D. contracta* (Brischke), *D. germanica* Horst., *D. holopyga* (Thoms.), *D. laricinella* Strobl., *D. longicaudata* Horst. şi *D. tenuipes* (Thoms.) (Table 1).

They parasitized the 2nd and 3rd instars of host larvae and contribute to the host annihilation before that to cause significant damages.

The host parasitizing by the *Diadegma* species obtained begins in the early of May, depending on the local and annual climatic conditions

The role played by that *Diadegma* species in the destruction of grape leaf-roller populations is about 3%. That is a minor value comparatively with the parasitism ratio of the parasitoid complex (20,77%) (Table 2).

1. *Diadegma contracta* (Brischke, 1880)

In Romania, this species is obtained for the first time as result of the rearing in laboratory.

In Dăbuleni locality, the year 2000, the species is present from the end of April because the *S. pilleriana* Den. et Schiff. larvae collected at the beginning of May were already infested. (Table 1). In the present case two *S. pilleriana* Den. et Schiff. larvae the second age were parasitized (5 and 7 mm in length). The caterpillars that were parasitized inside continued their growth and seemed to be undisturbed by the parasitoid presence and suffered sloughing them skin. In one of the cases presented above, on the 31.05.2005, the parasitoid larva built already its cocoon. In laboratory conditions, the larvae development period was about 20 days and the nymphosis was lasted 12 days, until the 12.06.2000 when a female hatched. When the larva was nourished with sweet water, it survived 18 days.

The other parasitized S. Den. et Schiff. caterpillar developed a male on 2.06.2000. The role played by this species in limiting the host populations is minor: 0,17% (Table 2).

The host-parasitoid relationship is new to science.

2. *Diadegma germanica* (Horstman, 1973)

In Romania it is known only from *Hedya pruniana* Hb. (Tortricidae) (Pisică, 2001).

In the collecting carried out in Dăbuleni and Ştefăneşti, the parasitized *S. pilleriana* Den. et Schiff. larvae sized between 4 and 9 mm, corresponding to 2nd and 3rd instars of host larvae. According to our notices, the host larvae that have no exterior sign of parasitism continued their growth suffering one or two sloughing them skin. The *S. pilleriana* larvae that sized 5 mm in the collecting moment grew until 11 mm suffering a sloughing its skin. The parasitoid larva consumes the vital organs of the host larva that is lively until the last moment. Only when the *D. germanica* larva is close to the end of development, the host larva become slower and in few our remains only its tegument. After the *D. germanica* larva was released, it starts to build the cocoon without removing the remainders of parasitized larva (Fig. 1).

Diadegma germanica Horst. is the most important parasitoid in both localities: the parasitism ratio was 1,4-8,37% (Table 2). With regard to the values of relative abundance, related to the numbers of individuals of *Diadegma*, the *Diadegma germanica* Horst. is noticed, that is dominant in the both localities.: 70-84%. (Fig. 2).

The host-parasitoid relationship is new to science.

3. *Diadegma holopyga* (Thomson, 1887)

In Romania it is known from *Plutella maculipennis* Curst. (Plutellidae) and *Coleophora gryphipennella* Bche. (Coleophoridae) (Pisică, 2001).

The *D. holopyga* Thoms. has a behaviour similar with the other *Diadegma* species.

The role played by this species in limiting the host populations is minor: 0,09%.

The host-parasitoid relationship is new to science.

4. *Diadegma laricinella* (Strobl, 1904)

In Romania, this species is obtained for the first time as result of the rearing in laboratory. It is new to Romanian fauna, too.

It is known from *Coleophora laricella* Hb. (*Coleophoridae*)(Ryan, 1979).

The role played by this species in limiting the host populations in Ştefăneşti is minor: 0,2%.

The host-parasitoid relationship is new to science.

5. *Diadegma longicaudata* (Horstman, 1969)

In Romania it is known a few hosts: *Archips rosanus* L., *Pandemis cerasana* Hb.(Tortricidae) (Pisică, 2001) and *Lobesia botrana* Den. et Schiff. (Pisică and Bărbuceanu, 2002).

The role played by this species in limiting the host populations is minor: 0,09%.

The host-parasitoid relationship is new to science.

6. *Diadegma tenuipes* (Thomson, 1887)

In Romania it is known from many host: *Panolis flammea* Schiff. (*Noctuidae*), *Pieris brassicae* L. (*Pieridae*), *Depressaria nervosa* Hw. (*Oecophoridae*), *Archips podanus* Scop., *A. rosanus* Thoms., *Hedya pruniana* Hb. (*Tortricidae*), *Meteorus albiditarsis* Curt. (*Braconidae*) (Pisică, 2001).

This species was present in the both localities, Ştefăneşti and Dăbuleni, and its behaviour is similar with the other *Diadegma* species. The contribution in the host populations limiting is minor: 0,15-0,8% (Table 2).

The host-parasitoid relationship is new to science.

CONCLUSIONS

In Ştefăneşti and Dăbuleni vineyards the grape leaf-roller *Sparganothis pilleriana* Den. et Schiff. larvae was parasitizing by 6 *Diadegma* species.: *D. contracta* (Brischke)*, D. germanica* Horst.*, D. holopyga* (Thoms.)*, D. laricinella* Strobl.*, D. longicaudata* Horst. şi *D. tenuipes* (Thoms.) They preferred the 2nd and 3rd instars of host larvae.

The host parasitizing by the *Diadegma* species obtained begins in the first period of May, depending on the local and annual climatic conditions.

The role played by *Diadegma* species in the reducing of grape leaf-roller populations is about 3%. *Diadegma germanica* Horst. is the most important parasitoid in both localities, the parasitism ratio being 2,39%.

6 host-parasitoid relationships have been recorded, all of them new to science.

ACKNOWLEDGEMENTS

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Tables

Table 1. The *Diadegma* species which parasitizing the grape leaf-roller *Sparganothis pilleriana* Den. et Schiff.

No. crt.	Localities	Data of collection	The parasitoid species	No. of individuals	The relative abundance (%)
1	Dăbuleni (Dj)	9.05.2000	*Diadegma contracta*	1 ♂, 1 ♀	8
2		9.05.2000	*Diadegma germanica*	11 ♀♀	84
		26.05. 2000		7 ♂	
		27.05.2002		1 ♀2♂♂	
3		28.05.2001	*Diadegma holopyga*	1 ♂	4
4		28.05.2001	*Diadegma tenuipes*	1 ♂	4
No. of individuals				25	
1	Ştefăneşti (Ag)	19.05.2002	*Diadegma germanica*	1 ♀2♂♂	70
		4.06.2002		2♂♂	
		1.06.2003		1 ♂, 1 ♀	
2		9.06.2000	*Diadegma laricinella*	1 ♂	10
3		11.06.1998	*Diadegma longicaudata*	1♀	10
4		1.06.2003	*Diadegma tenuipes*	1 ♂	10
No. of individuals				10	

Table 2. Efficiency of the genus *Diadegma* in limiting the host populations

Place	Year	No. of ind.	No. par.	%	*Diadegma* sp.													
					No	%	D. c.		D.g.		D.h.		D.la.		D.lg.		D.t.	
							No	%	No	%	No	%	No	%	No	%	No	%
Dăb. (Dj.)	2000	215	61	28,37	20	9,3	2	0,93	18	8,37	-	-	-	-	-	-	-	-
	2001	308	67	21,75	2	0,65	-	-	-	-	1	0,32	-	-	-	-	1	0,32
	2002	146	16	10,96	3	2,05	-	-	3	2,05	-	-	-	-	-	-	-	-
Subtotal		669	144	21,52	25	3,74	2	0,3	21	3,14	1	0,15	-	-	-	-	1	0,15
Ştef. (Ag.)	1998	27	5	18,51	1	3,7	-	-	-	-	-	-	-	-	1	3,7	-	-
	2000	64	12	18,75	1	1,56	-	-	-	-	-	-	1	1,56	-	-	-	-
	2001	124	18	14,52	0	0	-	-	-	-	-	-	-	-	-	-	-	-
	2002	164	30	18,29	5	3,05	-	-	5	3,05	-	-	-	-	-	-	-	-
	2003	122	34	27,87	3	2,46	-	-	2	1,64	-	-	-	-	-	-	1	0,82
Subtotal		501	99	19,76	10	2,00	-	-	7	1,4	-	-	1	0,2	1	0,2	1	0,2
Total		1170	243	20,77	35	2,99	2	0,17	28	2,39	1	0,09	1	0,09	1	0,09	2	0,17

D.c. = *Diadegma contracta (*Brischke) D.g. = *Diadegma germanica* Horst. D.h. = *Diadegma holopyga* (Thoms.)
D.la. = *Diadegma laricinella* Strobl. D.lg. = *Diadegma longicaudata* Horst. D.t. = *Diadegma tenuipes* (Thoms.)
Dăb. = Dăbuleni vineyard No. of ind. = number of individuals collected (larvae and pupae)
Ştef. = Ştefăneşti vineyard No. par. = number of individuals parasitized by parasitoids complex

Figures

Fig. 1. Cocoon of *Diadegma germanica* Horst. (original)

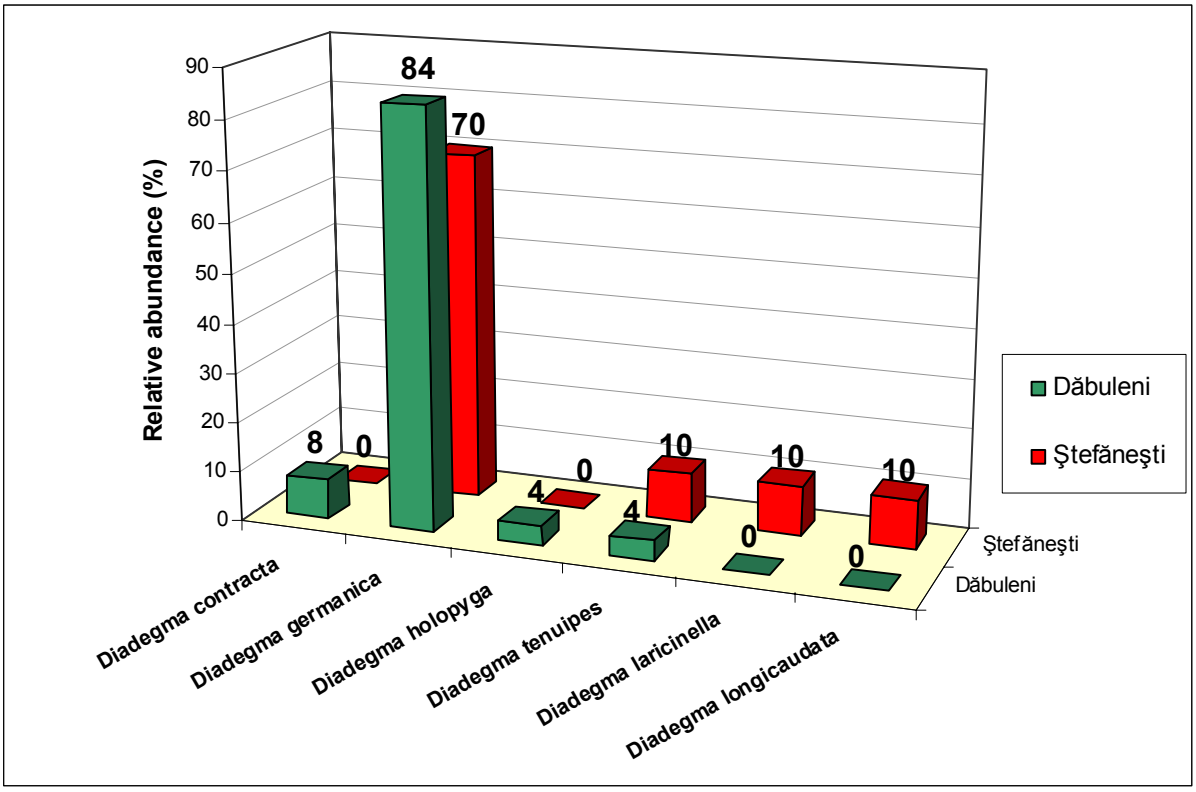

Fig. 2. The relative abundance (%) of the *Diadegma* specie

Lucrări ştiinţifice U.Ş.M.A.V.B., Seria B, Vol. L, 2007

MATHEMATICAL MODEL FOR TECHNICALLY OPTIMAL RATES OF MACRONUTRIENTS, TOR, DEDUCED BASED ON THE MODIFIED MITSCHERLICH RESPONSE FUNCTION AND THE CONDITION THAT THE EXPECTED YIELD REPRESENTS A GIVEN FRACTION FROM THE MAXIMUM YIELD - MODEL LIMITS

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In memoriam dr. doc. Zenoviu BORLAN

Keywords: technically optimal rates, computing model

ABSTRACT

The paper presents the mathematical deduction of a new computing model for Technically Optimal Rates of macronutrients (N, P, K etc.), TOR, expressed as kg/ha conventional active substances (a.s.). For this purpose, we have started form a modified Mitscherlich response function, which also substantiate the Romanian agrochemical system to establish the Economically Optimal Rates of macronutrients, EOR, as well as from the condition that the expected yield represents a fraction (fr) from the maximum yield, fr being close to 1. Computing applications in grape-vine have been done with the elaborated model. These showed the very high influence fr (which enter into the TOR model) has on the TOR value, leading very easy to its overestimation or underestimation, fact which invalidated this new TOR model.

INTRODUCTION

The problem concerning the technically optimal rates of macronutrients, TOR, have been broached in the papers of Borlan et al (1984, 1994), Budoi (2001, 2006, 2007) and others.

The researches presented in this paper have been carried out in the framework of the CEEX IMEV research project, 4-th stage, financed by CNMP/BIOTECH, Ministry of Education, Research and Youth, Romania. They aimed to improve the Romanian agrochemical system of fertilizers use by the elaboration of a new mathematical model for macronutrient TOR establishing.

MATERIALS AND METHODS

A Mitscherlich-Bray-Black response function have been used as start for TOR mathematical model deduction, as well as the condition that the expected yield represents a (high) fraction from the maximum yield. For the calculation of the action coefficients and the soil nutrient supply, which enter into TOR model, the same mathematical relations as for EOR are used, with the same coefficients, so TOR model does not need special field experiments for parameterisations. So, for the TOR test examples in fruiting grape-vine, the parameters from the papers of Budoi, Borlan et al, 1987, and Borlan et al, 1994, have been used.

This new TOR computing model (II) has been tested by comparison with another mathematical model (I) previously elaborated by Budoi (2007), presented at ESNA 2007 Conference.

RESULTS AND DISCUSSIONS

Mathematical deduction of TOR computing model (model II). *The Mitscherlich-Bray-Black response function* from which we started for the deduction of TOR model is (Borlan et al, 1984):

$$\mathbf{R = R_m(1 - 10^{-ca(As + x)})}$$

to which the following condition have been added:

$$\mathbf{R = R_m \cdot fr}$$

that means the expected yield represents the fr fraction from the maximum yield.

The significance of the terms in the above relations is:

R = the yield, kg/ha, obtained by the application of the mineral fertilizer in x rate (kg. a.s./ha) on a soil with A_s nutrient supply;

R_m = the maximum yield that can be obtained with the considered nutrient, kg/ha;

c_a = the action coefficient of the considered nutrient;

A_s = the soil nutrient supply, potentially available form, kg N, P_2O_5 or K_2O/ha, calculated with the same equations as for EOR (Borlan, 1984, 1994, Budoi et al., 1987), depending on soil nitrogen index, IN, and mobile P and K respectively;

x = increasing mineral fertilizer rate, kg N, P_2O_5 or K_2O/ha;

fr = fraction from the maximum yield, Rm, for which we compute TOR, in under-unitary values from Rm, but close to 1.

Taking into account the upside condition, the response function becomes:

$$R_m \cdot fr = R_m(1 - 10^{-c_a(As + x)})$$

Reducing Rm, the relation becomes:

$$fr = 1 - 10^{-c_a(As + x)}$$

from which:

$$10^{-c_a(As + x)} = 1 - fr$$

By logarithmation, we obtain:

$$lg10^{-c_a(As + x)} = lg(1 - fr)$$

relation equivalent with:

$$-c_a (A_s + x) lg10 = lg(1 - fr)$$

from which, taking into account that lg10 = 1, results:

$$A_s + x = lg(1 - fr) / -c_a$$

From here we obtain the computing relation for x = DOT:

$$x = [lg(1 - fr) / -c_a] - A_s$$

respectively the relation for DOT calculation (model II):

$$\mathbf{DOT, kg\ N, P_2O_5, K_2O/ha = \frac{lg(1 - fr)}{-c_a} - A_s}$$

in which the left-side term, $[lg(1 - fr) / -c_a]$, represents the total technical optimal need of nutrient (kg N, P_2O_5, K_2O/ha), from soil and fertilizers.

The TOR computing mathematical model can be written as:

$$DOT, \text{ kg N, } P_2O_5, K_2O/ha = \{[lg(1 - fr)] + c_a \cdot A_s\} / -c_a$$

Testing by calculation the model (II) DOT = {[lg(1 - fr)] + $c_a \cdot A_s$} / -c_a, comparatively with model (I) DOT = [lg(2.303 · c_a · R_m)] / c_a - A_s. The analyses of sensitivity of the TOR computing model (II) to fr variation, as compared with model (I).

Let be fruiting grape-vine, table variety with middle precocity, in which R_m = 12000 kg/ha, fr = 0.996953, and the soil have the nitrogen index IN = 2.

The nitrogen action coefficient is:

$$c_a = a + b/R_s = 0.071 + 57.5/12000 = 0.01189.$$

The soil nitrogen supply is:

A_s, kg N/ha = $A_{s\ max}(1 - 10^{-c \cdot IN}) + d \cdot R_m = 80(1 - 10^{-0.4 \cdot 2}) + 0.0045 \cdot 12000 = 121.3$.

In c_a and A_s relations, the coefficients published by Borlan et al (1994) have been used. The c_a and A_s values are the same for both TOR models.

Calculation of nitrogen TOR with model (II):

$$DOT, kg\ N/ha = [lg(1 - fr) / -c_a] - A_s =$$
$$= [lg(1 - 0.996953) / -0.01189] - 121.3 = 90.3.$$

Calculation of nitrogen TOR with model (I):

$$DOT, kg\ N/ha = [lg(2.303 \cdot c_a \cdot R_m)] / c_a - A_s, =$$
$$= lg(2.303 \cdot 0.01189 \cdot 12000) / 0.01189 - 121.3 = 90.3.$$

We observe that in particular case of fr = 0.996953, TOR calculated with the two models have practically the same values. Without supplementary researches somebody can believe that both models are the same suitable for TOR calculation, which would be a mistake.

For the analyses of sensitivity of the TOR computing model (II) to fr variation, as compared with model (I), calculations have been done, whose results are presented in table 1.

As it results from the structure of the two mathematical models, the results from table 1 show that if the TOR calculated with model (I) are independent by fr, the TOR calculated with the model (II) depend very much by fr, a small variation of fr leading to unnatural variations of TOR. So, if in the particular case of fr = 0.996953 the rates calculated with the two models coincide, TOR = 90.3 kg N/ha, at fr = 0.999999 the rate calculated with model (II) TOR = 383 kg N/ha, so is overestimated more than 4 times as compared with the rate calculated with model (I), meanwhile at fr = 0.97, TOR = 6.7 kg N/ha, that means it is dramatically underestimated.

So, the present researches invalidate/disqualify the model (II) for TOR calculations. First condition for this model validation is a small variation of TOR to a variation of fr from 0.95 to 0.999999 and even from 0.9 to 0.999999.

There is no excluded that, by supplementary elaborations and conditions, future researches impose a reconsideration of TOR mathematical deduction based on the fraction fr from R_m.

For TOR calculation, the model (I) (Budoi, 2007), $DOT = [lg(2.303 \cdot c_a \cdot R_m)] / c_a - A_s$, has to be used, in which the rates does not vary with fr.

CONCLUSIONS

The Technically Optimal Rates of macronutrients, TOR, calculated with the new mathematical model (II): $DOT, kg\ N, P_2O_5, K_2O/ha = \{[lg(1 - fr)] + c_a \cdot A_s\} / -c_a$, vary to much to a small fr variation, giving unnatural, wrong values, overestimated or underestimated, fact that leaded to its invalidation.

For TOR calculation, the model (I): $DOT = [lg(2.303 \cdot c_a \cdot R_m)] / c_a - A_s$, have to be used, in which the rates do not vary with fr and give good results.

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Table 1. The analyses of sensitivity of the TOR computing model (II) to fr variation, as compared with model (I)

fr	**Model (II)** **DOT, kg N/ha = $(lg(1-fr)/-c_a)-A_s$**	**Model (I)** **DOT, kg N/ha = $lg(2.303c_a \cdot R_m)/c_a-A_s$**
0.999999	383.2	90.3
0.999000	131.0	90.3
0.996953	**90.3**	**90.3**
0.980000	21.6	90.3
0.970000	6.7	90.3

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THE EXCESS ELIMINATIONS THE IRON AND COPPER IONS OF WINE WITH REVERSE OSMOSES MEMBRANES

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Keywords: wine, filtrate, concentrate, biotechnology, ecological.

ABSTRACT

The work paper "The excess eliminations the iron and copper ions of wine with reverse osmoses membranes" has the purpose the eliminating the iron and cooper ions from red and white wines. Through that new method will eliminate the contaminating risk with CN^- ion through wrong treatment with ferrocyanide, potassium, will get out the impact of blue, Prussian - deposit on natural environment, it will eliminate the potassium cyanide usage in the vinification process for establishing and conditioning wines, will retrieve 1,8-2% wine from process. The studied wines are passed through the reverse osmoses module, in this process decrease the iron and cooper ions concentration of wine from osmoses process obtaining in the end, a wine which keep on the parameters and naturalness of initial wine. Through the new biotechnology will obtain an ecological product from conditioning and establishing of wine.

INTRODUCTION

The reverse osmoses process which is used in the establishing and conditioning technology of red and white wines has the purpose: the eliminations of iron and copper ions from (red and white) wines for it ´s biological establishing; the risk eliminating to contaminating the wine with cyan ion(CN^-) through the wrong applying of treatment with ferrocyanide, potassium; the eliminating of precipitant resulted from reaction of iron ferrous with ferrocyanide, potassium and resulting the ferrocyanide ferica; the get out the impact deposit of ferrocyanide, potassium on natural environment, the deposit eliminating by blue, Prussian in proportion by 1,8-2% from wine treated quantity, no – economically recovery, which is noxious on the environment; the total eliminating ferocyanide, potassium treating wine for eliminations iron and copper ions exceeding (5,67 mg ferrocyanide, potassium for 1 mg ferrous iron).

MATERIAL AND METHODS

During the period 2005-2008 to the Station for Researching and Developing for Viticulture and Wine-preparation Murfatlar is performing the researches regarding the establishing and conditioning red and white wines technologies and especially regarding of cooper and iron ions, to bring them in the moderate quantities but without un balance into the wine: iron (2-4 mg/l), cooper (0,1-0,3 mg/l). The experiments were performed in the laboratory conditions and micro production conditions. The experiments was made with dry, half dry, half sweet wines and red dry, half dry, half sweet wines which are the object of study.

The analyses of conditioned and established white and red wines before the get out the iron and cooper ions help by the reverse osmoses, and after passing wine about reverse osmoses with membranes are noted to the table 1 and table 2.

The passing wine was performed through the reverse osmoses with membranes with molecular cutting by 400 DALLTON, HYRONAUTIC ESPA – 1 SPA 4040 type.

RESULTS AND DISCUSSION

The studied wines are passed through reverse osmoses and after this process decrease the iron and cooper ion concentration from the wine complied with osmoses. In the end, it will be obtained a wine which will keep the parameters and the naturalness original wine.

Through the new technology, from the point of view of stabilization conditionality will be obtained an ecological produce.

The experiments were achieved on established and conditioned natural wines with special parameters for wines with Controlled Origin and Quality (DOC) des tairs.

OPERATION 1

The physical – chemical tests after the wine passing through the reverse osmoses module with membranes by 400 DALL – white wines – retentat (concentrate)(table 1).

The physical – chemical tests after the wine passing through the reverse osmoses module with membranes by 400 DALL – red wines –retentat (concentrate)(table 2).

OPERATION 2

The obtained filtrate product to the white wines passing through the reverse osmoses module will pass from storage 3 to storage 1 and will repeat the process of passing filtrate product through the reverse osmoses equipped with membrane which has the molecular cutting by 300 DALL and will obtained a filtrate product with follow composition.

The filtrate product obtained from red wine passing through the reverse osmoses module will pass from storage 3 to storage 1 and will repeat the process of passing filtrate product through the reverse osmoses equipped with membrane which has the molecular cutting by 300 DALL and will obtained a filtrate product with follow composition.

OPERATION 3

The obtained filtrate product from white wines OP2, (endogen water) will mix with concentrate from OP1 and will result the white wine with cooper and iron ions with reduced quantities which not affect the wine evolution (table 3)

The obtained filtrate product from red wines OP2, (endogen water) will mix with concentrate from OP1 and will result the wine with cooper and iron ions with reduced quantities which not affect the wine evolution (table 4).

CONCLUSIONS

1. The technology of conditioning and stabilization wines with the elimination of copper and iron exceeding through the reverse osmoses membranes is a biotechnology which keeps the naturalness of product.
2. The last passing through the reverse osmoses membranes result the endogen water of every type a part, the water will mix with concentrated wine from the first passing from membrane – the operation keep the initial wine parameters and its naturalness.
3. The part which has in retentat (concentrate) from second passing, has in its composition the cooper and iron ions in the concentrate quantities, represent quantitative 1,5-2% from initial quantity which was worked.
4. Through the new biotechnology will get out the raw material consumption (ferrocyanide, potassium), will reduce the wine consumption which passing in the blue, Prussian deposit, it will eliminate the impact with environment
5. Through the new biotechnology will obtain an ecological product from conditioning and establishing point of view.
6. The cost price of wine un ironing with ferrocyanide, potassium is about 0,12 lei/litter comparatively with the cost price using the proceeding to get out of cooper and iron exceeding from wine through the reverse osmoses membrane which is about 0,094 lei/litter.

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Tables

Table 1. The physical – chemical tests after the wine passing through the reverse osmoses module with membranes by 400 DALL – white wines – retentat (concentrate)

Nr crt	Wine assortment / Component determinant	Pinot gris	Chardonnay	Muscat Ottonel	Columna	Riesling italian
1	Alcohol contens (% vol)	11,9/7,1	12,1/7,3	11,8/6,6	12,4/7,1	11,7/8,4
2	Reduced extract contens (g/l)	24,2/34,5	23,9/34,0	24,6/36,4	23,8/33,9	22,6/33,9
3	Total acidity (g/l H_2SO_4)	4,3/5,7	4,9/6,0	4,1/5,6	5,2/6,8	4,6/5,9
4	Volatile acidity (g/l CH_3COOH)	0,39/0,60	0,40/0,62	0,42/0,61	0,36/0,52	0,35/0,50
5	Ash contents (g/l)	1,91/2,2	1,98/2,6	1,97/2,4	1,80/2,7	1,87/2,56
6	Ash alkalinity (g/l	1,83/1,94	1,74/1,83	1,68/1,76	1,57/1,69	1,62/1,70
7	Reduced sugar (g/l	25,0/33	12,0/16	18,0/24	3,0/4	3,2/4,1
8	Glycerine (g/l)	8,12/10,6	8,3/10,8	7,9/10,3	7,2/10,1	8,0/10,7
9	Acetaldehyde mg/l	38/39	40/51	36/47	32/45	34/47
10	D_{420} nm (1 cm)	0,038/0,0049	0,032/0,042	0,035/0,044	0,031/0,040	0,029/0,039
11	Total polyfenol (mg/l)	282/365	278/361	286/371	267/347	294/382
12	Tanin polyfenol (mg/l)	105/136	98/127	110/143	95/123	105/136
13	Total azote (mg/l)	315/410	365/472	380/490	320/410	305/395
14	pH wine	3,20	3,10	2,98	2,95	3,01
15	rH wine	14,10	14,00	15,30	14,60	15,20
16	Totalpolysacchari-de (mg/l)	230/295	270/350	280/360	267/345	304/395
17	Total gum (mg/l)	160/206	164/210	170/220	158/205	168/218
18	Acid, tartric (g/l)	4,12/5,3	4,0/5,2	3,96/5,0	3,67/4,8	4,0/5,2
19	SO_2 free (mg/l)	50/65	48/62	45/58	45/58	48/62
20	SO_2 total (mg/l)	168/218	120/156	145/185	90/115	95/123
21	Iron (mg/l)	2,95	2,60	2,40	2,75	2,1
22	Copper (mg/l)	0,18	0,20	0,23	0,15	0,20

Table 2 .The physical – chemical tests after the wine passing through the reverse osmoses module with membranes by 400 DALL – red wines –retentat (concentrate)

Nr crt	Wine assortment / Component determinant	Cabernet Sauvignon	Merlot	Pinot noir	Fetească neagră	Mamaia
1	Alcohol contens (% vol)	12,5/7,8	12,2/7,6	11,8/8,2	12,6/8,4	11,6/7,5
2	Reduced extract contens g/l	25,4/33	24,8/32	26,2/34	24,8/32	25,6/33,2
3	Total acidity g/lH_2SO_4	4,2/5,46	4,0/5,2	4,1/5,3	4,5/5,8	4,2/5,46
4	Volatile acidity g/l CH_3COOH	0,32/0,41	0,38/0,49	0,40/0,52	0,36/0,46	0,39/0,50
5	Ash contents g/l	1,84/2,4	2,01/2,6	1,95/2,5	1,80/2,3	1,90/2,47
6	Ash alkalinity g/l	1,38/2,5	1,46/1,9	1,39/1,8	1,32/1,7	1,37/1,8
7	Reduced sugar g/l	2,90/3,7	3,0/3,9	24,0/31,2	3,2/4,1	38,0/49,0
8	Glycerine g/l	8,78/11,4	7,60/9,88	9,10/11,8	8,56/11,1	9,34/12,1
9	Acetaldehyde mg/l	34,0/44	32,0/41,6	41,0/53	36,0/46,8	39,0/50
10	Total polyfenol mg/l	1950/2100	1800/1950	850/980	1850/2100	900/1100
11	Tanin polyfenol mg/l	106/138	112/145	108/140	110/143	109/141
12	Symple polifenoli mg/l	92/119	89/115	78/101	86/112	90/117
13	Colorant intensity (Is)	0,66/0,86	0,53/0,69	0,38/0,49	0,64/0,83	0,35/0,45
14	Tent colour (Ts)	0,45	0,39	0,32	0,45	0,31
15	Total azote mg/l	580/754	540/702	460/598	485/810	510/663
16	D_{280} nm (1 cm)	64/83	62/80,6	56,4/73,3	68,7/89	52,7/68,5
17	Antociani mg/l	420/546	412/535	390/510	430/600	380/450
18	pH wine	3,50	3,40	3,24	3,42	3,25
19	rH wine	16,0	15,80	16,2	15,30	15,70
20	Total polysaccharide mg/l	430/559	410,6/534	420,8/547	289/376	265,5/345
21	Total gum mg/l	249/324	262/340	236/307	310/403	264/343
22	Acid, tartric g/l	3,70/4,8	3,60/4,68	3,50/4,55	3,78/4,9	3,45/4,48
23	SO_2 free mg/l	41/53	38/49	50/65	35/45	45/58
24	SO_2 total mg/l	85/110	92/120	120/156	90/117	145/188
25	Iron mg/l	1,6	1,4	2,1	2,3	2,1
26	Copper mg/l	0,12	0,16	0,18	0,2	0,19

Table 3. The physical – chemical characteristics of white wine with cooper and iron ions quantitatively reduced

Nr crt	White assortment / Component determinant	Pinot gris	Chardonnay	Muscat Ottonel	Columna	Riesling italian
1	Alcohol contens % vol	11,7	12,0	11,6	12,1	11,4
2	Reduced extract contens g/l	25,4	24,1	25,6	24,9	23,8
3	Total acidity g/l H_2SO_4	4,6	5,0	4,3	5,0	4,8
4	Volatile acidity g/l CH_3COOH	0,42	0,46	0,48	0,39	0,37
5	Ash contents g/l	1,94	2,0	1,99	1,84	1,89
6	Ash alkalinity g/l	1,84	1,71	1,62	1,59	1,68
7	Reduced sugar g/l	26	14	18	3,2	3,5
8	Glycerine g/l	8,4	8,1	8,2	7,5	7,9
9	Acetaldehyde mg/l	39	42	35	34	36
10	D_{420} nm (1 cm)	0,040	0,036	0,034	0,035	0,030
11	Total polyfenol mg/l	286	281	289	271	301
12	Tanin polyfenol mg/l	110	102	114	98	108
13	Total azote mg/l	318	372	386	332	309
14	pH wine	3,2	3,1	2,98	2,96	3,06
15	rH wine	14,2	13,8	15,0	14,2	15,0
16	Totalpolysaccharide mg/l	236	274	286	274	310
17	Total gum mg/l	158	162	172	160	170
18	Acid, tartric g/l	4,10	3,90	3,91	3,65	3,95
19	SO_2 free mg/l	42	45	41	40	42
20	SO_2 total mg/l	160	115	140	86	90
21	Iron mg/l	9,2/1,9	8/2,1	7,6/2,3	8,9/1,8	6,7/1,5
22	Copper mg/l	0,63/0,2	0,74/0,15	0,90/0,18	0,69/0,14	0,76/0,16

Table 4. The physical – chemical characteristics of red wine with cooper and iron ions quantitatively reduced

Nr crt	Wine assortment / Component determinant	Cabernet Sauvignon	Merlot	Pinot noir	Fetească neagră	Mamaia
1	Alcohol contens (% vol)	12,3	12,0	11,5	12,1	11,3
2	Reduced extract contens g/l	26,0	25,1	26,4	25,2	26,0
3	Total acidity (g/l H_2SO_4)	4,1	3,9	4,0	4,6	4,0
4	Volatile acidity (g/l CH_3COOH)	0,36	0,41	0,42	0,39	0,43
5	Ash contents (g/l)	1,9	2,1	1,98	1,84	1,92
6	Ash alkalinity (g/l)	1,40	1,48	1,41	1,35	1,39
7	Reduced sugar (g/l)	3,0	3,0	25,0	3,4	38,0
8	Glycerine (g/l)	8,8	7,8	9,0	8,7	9,4
9	Acetaldehyde (mg/l)	36	35	43	38	43
10	Total polyfenol (mg/l)	1980	1850	870	1900	950
11	Tanin polyfenol (mg/l)	108	115	110	114	112
12	Symple polifenoli (mg/l)	95	91	80	84	89
13	Colorant intensity (Is)	0,61	0,50	0,34	0,60	0,31
14	Tent colour (Ts)	0,42	0,38	0,31	0,46	0,32
15	Total azote mg/l	582	546	452	480	521
16	D_{280} nm (1 cm)	62	60	54	65	50
17	Antociani mg/l	426	416	400	450	400
18	pH wine	3,40	3,32	3,15	3,40	3,15
19	rH wine	16,10	15,80	16,20	15,40	15,75
20	Total polysaccharide mg/l	432	415	425	300	275
21	Total gum mg/l	250	265	240	325	268
22	Acid, tartric g/l	3,7	3,6	3,5	3,8	3,5
23	SO_2 free mg/l	35	34	42	32	40
24	SO_2 total mg/l	80	90	115	85	136
25	Iron mg/l	8,6/2,6	7,9/2,4	8,9/3,0	9,2/2,3	9,0/1,9
26	Copper mg/l	0,3/0,1	0,5/0,09	0,4/0,12	0,7/0,15	0,6/0,08

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THE SPECTRUM OF THE ACARIANS SPECIES FROM THE VINEYARD DEALURILE CRAIOVEI

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Key words: eryophids and tetranychidae mytes, density of the acarians population

INTRODUCTION

The eryophids and tetranychidae mytes of the vine are beside the vine moth the main pests for the Dealurile Craiovei vineyards, their presence year by year in the vineyard from the S.D. Banu Maracine also due to the damages produced by those pests justify the taken action in order to know the acarians spectrum, their biology, way of attack and for controling those pests.

MATERIALS AND METHOD

The density of the acarians population has been estimated through visual controls during the vegetative repose as well during the vegetation period, there have been collected samples, also there have been performed laboratory tests for the collected samples. Thuse, during 2005-2007 there has been established and inventoried the acarian complex that characterize the the viticultural ecosystem Banu Mărăcine – Craiova.

In order to estimate the density of the acarians population, during the vegetative repose, there have been analyzed 100 vine logs, through observations with the binocular telescopes (field glasses), in the field and laboratory. The analyzed vine logs belong to 9 different vine varieties. During the vegetation period the estimation has been made through field glasses analyze, for 10 leaves collected from 50 vine logs, in different vegetation phenophase, during Aprilie-August.

RESULTS AND DISCUSSIONS

During 2005 (table 1), the weight of the acarians, during the vegetative repose, in the viticultural ecosystem from S.D. Banu Mărăcine – Craiova, has been of 51,25% *Eriophyes vitis*, 36,51% *Tetranychus urticae*, 7,37% *Panonychus ulmi*, 4,85% *Calepitrimerus vitis*. During 2006 E. vitis has been recorded with an percentage of 51,44%, T. urticae 34,96%, P. ulmi 8,87% and C. vitis 4,71%, in 2007 E. vitis 55,0%, T. urticae 32,6%, P. ulmi 7,8% and C. vitis 4,6%.

Regarding the weight of the acarians, during the vegetative repose, in the viticultural ecosystem from S.D. Banu Mărăcine – Craiova, during 2005-2007, has been of 52,56% *Eriophyes vitis*, 34,69% *Tetranychus urticae,* 8,01% *Panonychus ulmi*, *Calepitrimerus vitis* 4,72% (table 1, fig. 1)

During 2005 (table 2), the weight of the acrians species in the viticultural ecosystem S.D. Banu Mărăcine, during the vegetation period has been of 54,21% *Eriophyes vitis*, 38,08% *Tetranychus urticae*, 6,61% *Panonychus ulmi*, 4,58% *Calepitrimerus vitis*. During 2006 E. vitis has been recorded with an percentage of 53,43%, T. urticae 34,92%, P. ulmi 7,97% and C. vitis 3,66%, in 2007 E. vitis 59,88%, T. urticae 30,01%, P. ulmi 6,91% and C.

vitis 3,18%. Regarding the weight of the acarians species during the vegetation period, in the viticultural ecosystem S.D. Banu Mărăcine – Craiova, during 2005-2007, this was of 55,84 % *Eriophyes vitis*, 34,33 % *Tetranychus urticae*, 7,16 % *Panonychus ulmi*, 3,80 % *Calepitrimerus vitis* (table 2, fig.2).

During the research period, 2005-2007, in the climatic condition of S.D. Banu Mărăcine-Craiova, the most frequent species of acarians has been: *Eriophyes vitis* Page. (54,20 %) and *Tetranychus urticae* Koch. (34,51 %). Beside those species there has been noticed the presence of the following species: *Panonychus ulmi* Koch. (7,58 %) and *Calepitrimerus vitis* Nal. (4,46 %), table 3, fig. 3.

CONCLUSIONS

As a general conclusion we can acertain that during the research period, 2005-2007, in the climatic conditions specific for the Banu Mărăcine-Craiova area, the most frequent acarians speciesc encountered was: *Eriophyes vitis* Page. (54,20 %) and *Tetranychus urticae* Koch. (34,51 %). Beside those species there has been noticed the presence of the species *Panonychus ulmi* Koch. (7,58 %) and *Calepitrimerus vitis* Nal. (4,46 %).

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Tables

Table 1. The weight of the acarians species, during the vegetative repose, in the viticultural ecosystem Banu Mărăcine (2005-2007)

Year	Total of the analyzed vine logs	Vine logs with acarians					Acarians species (%)			
		E. vitis	*T. urticae*	*P. ulmi*	*C. vitis*	Total	*E. vitis*	*T. urticae*	*P. ulmi*	*C. vitis*
2005	900	306	218	44	29	597	51,25	36,51	7,37	4,85
2006	900	284	193	49	26	552	51,44	34,96	8,87	4,71
2007	900	275	163	39	23	500	55,00	32,60	7,80	4,60
Average 2005-2007							52,56	34,69	8,01	4,72

Table 2 . The weight of the acarians species, during the vegetative period, in the viticultural ecosystem Banu Mărăcine (2005-2007)

Year	Nr. of analyzed leaves	Number of attacked leaves					Acarians species (%)			
		E. vitis	*T. urticae*	*P. ulmi*	*C. vitis*	Total	*E. vitis*	*T. urticae*	*P. ulmi*	*C. vitis*
2005	4500	1549	1088	189	131	2857	54,21	38,08	6,61	4,58
2006	4500	1400	915	209	96	2620	53,43	34,92	7,97	3,66
2007	4500	1506	755	174	80	2515	59,88	30,01	6,91	3,18
Average 2005-2007							55,84	34,33	7,16	3,80

Table 3. The weight of the acarians species in the viticultural ecosystem Banu Mărăcine, during 2005-2007

Period	% acarians species											
	E. vitis %			*T. urticae* %			*P. ulmi* %			*C. vitis* %		
	R. veg.	P. veg.	Average	R. veg.	P. veg.	Average	R. veg.	P. veg.	Average	R. veg.	P. veg.	Average
2005-2007	52,56	55,84	54,20	34,69	34,33	34,51	8,01	7,16	7,58	4,72	3,80	4,26

Figures

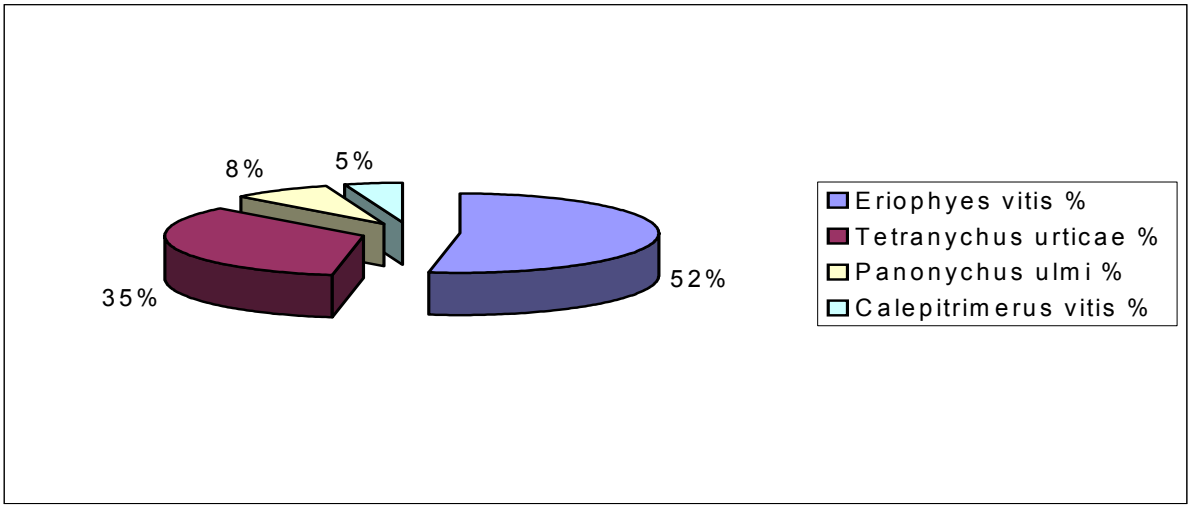

Fig. 1 The weight of the acarians species, during the vegetative repose, in the viticultural ecosystem Banu Mărăcine (2005-2007)

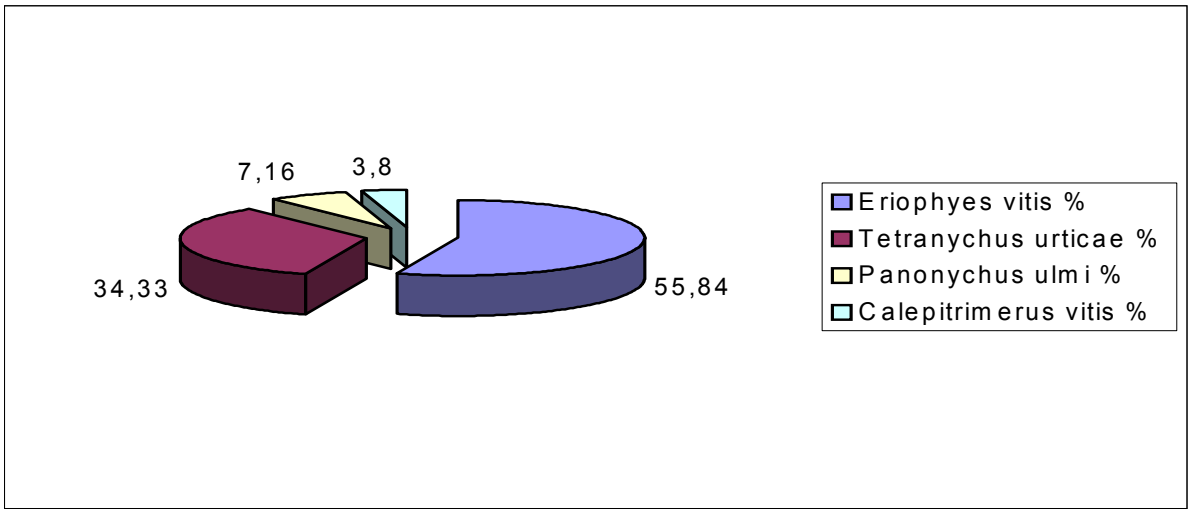

Fig. 2 The weight of the acarians species, during the vegetative period, in the viticultural ecosystem Banu Mărăcine (2005-2007)

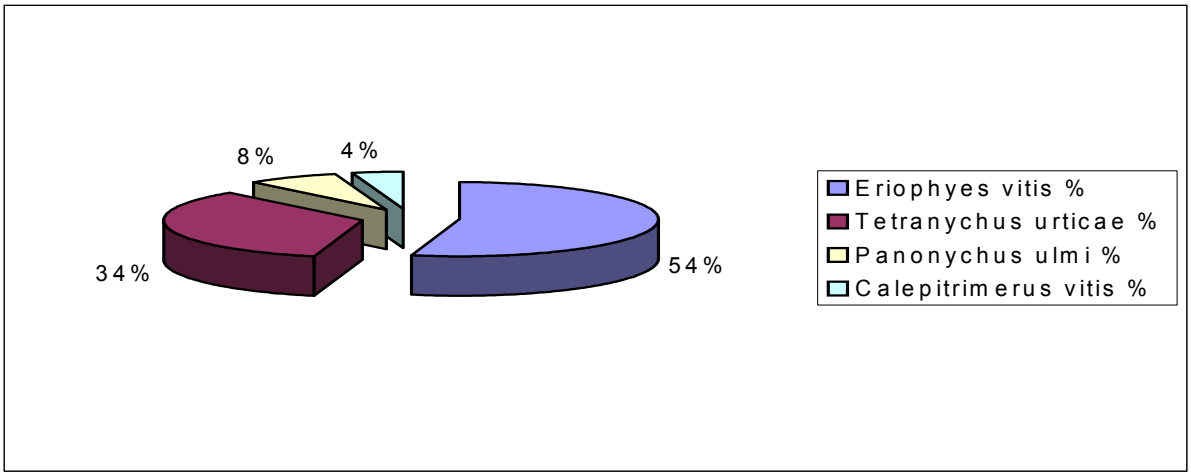

Fig. 3 The weight of the acarians species in the viticultural ecosystem Banu Mărăcine, during 2005-2007.

Lucrări ştiinţifice U.Ş.M.A.V.B., Seria B, Vol. L, 2007

FUNDAMENTAL ASPECTS CONCERNING THE APPLICATION OF THE PULSATORY ELECTRIC FIELD (PEF) TECHNOLOGY IN WINE STABILIZATION

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Keywords: tartaric stability, proteic stability, microbiological stability, efficacy.

ABSTRACT

PEF technology used for stabilizing wines proves to be highly interesting due to the fact that this is a friendly innovative technology based on non-heating procedures, therefore not influencing on the savor, color and nutritional value of the treated products. The study aimed at evaluating the efficacy of different technical variants involved in the PEF treatment applied for reaching both the biochemical (tartaric and proteic stability) and microbiological stability of the wines. The technical variants were differentiated by the type of the pulse generator, as well as by the treatment length of time. There were taken into study 2 types of pulse generators (corona and in plasma discharge) and 3 treatment periods: 10, 15 and 20 minutes. The experiments were carried out at the laboratory scale, by using the PEF treatment equipment conceived and achieved by CCEE Bucharest, Romania. Observations were made concerning the biochemical (tartaric and proteic stability) and microbiological stability of the wines. The carried out study highlighted the efficacy of the PEF treatment applied for reaching the biochemical and microbiological stability of the white and red wines. PEF treatment may be considered quite a potential treatment to be successfully used for making wines stable, sure and secure.

INTRODUCTION

The scientific background of the pulsatory electric field (PEF) technology consists in applying an electric field of high intensity represented by pulses applied for short periods of time. Whenever such an electric field is applied on the biological cells, the half permeable barrier of the cell membrane is destroyed (Knorr and Angersback, 1998; Barbosa-Canovas et al., 2000) because of the engendering pores (Winterhalter and Helfrich, 1987; Teissie et al., 1999). The process represented by the cell destruction in pulsatory electric field is known under the name of electroplasmolysis(Weaver and Chizmadzhev, 1996; McLellan and Kime, 1991;Gudmundsson and Mafsteinsson, 2001).

The PEF technology has multiple applications among which it is worth mentioning the non-heating pesteurization of the alimentary liquids (Niculita Petru et al., 2006). The PEF technology applied in the enological area is nowadays under study in ITV France (site www.itvfrance.com, 2007). Just from the beginning, the experiments which were carried out showed the efficacy of the PEF treatment on the wine yeasts and bacteria.

This paper presents the results of the research concerning the evaluation of the efficacy proved by different technical variants of PEF treatment applied for reaching the biochemical (tartaric and proteic) and microbiological stability of the wines. The technical variants were differentiated both by the pulse generator type in operation and by the treatment period.

PEF technology applied for wine stabilization is valuable due to the fact that this one is an friendly innovative technology based on non-heating procedures, without influencing on the savor, color and nutritional value of the products undergoing such a treatment.

At the national level, PEF technology was experimented when processing the black grapes (Tudorache et al., 2006; Tudorache et al., 2006; Cramariuc et al., 2007). The results

obtained demonstrated that the PEF treatment improves the phenolic extraction and the extraction rate of the liquid fraction, without organoleptically altering the must.

MATERIALS AND METHODS

The experiment was carried out at the laboratory scale, on 6 wine batches (3white wines and 3 red wines) which presented the 4^{th} level of stability corresponding to the wines which are not stabilized.

The equipment for the PEF treatment (fig. 1) was conceived and achieved by CCEE Bucharest, Romania. It consists in a pulse generator (1), reactor (2) and treatment chamber (3).

Two variable factors were studied: A= pulse generating source and B= treatment period. The factor A had two graduations (1 = corona discharge and 2 = in plasma discharge), and the factor B had three graduations (1 = 10 minutes, 2 = 15 minutes and 3 = 20 minutes). The wine which did not undergo PEF treatment represented the variant taken as a control.

Observations were made concerning the tartaric, proteic and microbiological stability of the wines. The tartaric stability was evaluated by considering the temperature of saturation in potassium bitartrate (Ts), applying therefore the method proposed by Wurdig et al. (1980,1982). The proteic stability was estimated according to the proteic deposit, and the microbiological stability was given by the microbiological load expressed in Units Forming Colonies by ml (UFC/ml). The microbiological analysis method complied with MA-F-AS4-01-AN MICR method included in the "Recueil International des methodes d'analyse (2006)".

The primary data were statistically processed by using the variance analysis (Saulescu and Saulescu, 1967), as well as graphically.

RESULTS AND DISCUSSIONS

1. The effects of the PEF technological variants on the tartaric stability of the wines

The PEF technological variants differentiated by the pulse generation source and by the treatment period of time had a distinctly significant influence on the tartaric stability of both the red and white wines (Table 1). The interaction between the two factors was also significant.

The setting in order of the PEF technological variants according to their tartaric stability is rendered in Table 2. The best tartaric stability of both the white and red wines was registered in case of the technological variant to which the pulse generation source with in plasma discharge was applied for 20 minutes.

2. The effects of the PEF technological variants on the proteic stability of the wines

The pulse generation source had an altogether different influence on the proteic stability, according to the type of wine. The influence was insignificant in case of the white wines, whereas in case of the red wines it was quite significant (Table 3). The treatment period of time had a distinctly significant influence on the proteic stability of both the white and red wines. The interaction of the two factors was distinctly significant for the white wines and insignificant for the red wines.

The setting in order of the PEF technological variants according to their proteic stability is rendered in Table 4. The best proteic stability was obtained in case of the variant to which in plasma discharge source was applied, the treatment being applied for 20 minutes. The best proteic stability was reached in case of the variant a1b3 belonging to the group of white wines and in case of the variant a2b3 belonging to the group of red wines (Table 4).

3. Effects of the PEF technological variants on the microbiological stability of the wines

The pulse generation source had a distinctly significant influence on the stability of the white wines and significant on the stability of the red wines (Table 5). The influence of the treatment period was distinctly significant both in case of the white and the red wines.

The technological variant to which the pulse generation source with in plasma discharge was applied for 20 minutes showed the best microbiological stability (Table 6).

4. Comparison between the stability of the untreated and PEF treated wines

The PEF treatment is efficient for the biochemical and microbiological stabilization of the finished wines. The PEF treated wine registered a temperature of saturation in potassium bitartrate which was 51% lower than in case of the untreated wine. The proteic deposit of the PEF treated wine was 46% greater than that of the wine taken as control.

The diminution rate registered by the microbiological load in case of the PEF treated wine was of 2.80.

CONCLUSIONS

The study concerning the evaluation of the efficacy which the PEF treatment has on the biochemical and microbiological stability of the white and red wines showed that the PEF technology may be successfully applied in the winemaking industry. The study may be concluded as it follows:

1. The pulse generation sources named “corona discharge” and “in plasma discharge” have a significant influence on the tartaric, proteic and microbiological stability of the wines.

2. The biochemical stability parameters of the PEF treated wines are superior to the parameters of the untreated wines, as it follows: the saturation temperature in potassium bitartrate decreases by 51% and the proteic deposit increases by 46%.

3. The diminution rate of the microbiological load of the PEF treated wines registered the value of 2.80.

ACKNOWLEDGEMENTS

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Tables

Table 1

The influence of the PEF technological variants on the tartaric stability of the wines, by considering their temperature of saturation in potassium bitartrate

Variability cause	SP	GL	s^2	Sample F	
				calculated	theoretical
White wines					
Total factor A	40.7983	5			
Repetitions	0.0347	2			
Pulse generation source	40.6948	1	40.6948**	1182.98	18.5; 98.5
Error (a)	0.0688	2	0.0344		
Total factor B	87.3382	17			
Treatment period	36.85	2	18.425**	307.08	4.26; 8.64
Interaction AxB	9.64	2	4.82**	80.33	4.26; 8.64
Error (b)	0.06	8	0.075		
Red wines					
Total factor A	47.30	5			
Repetitions	0.05	2			
Pulse generation source	47.20	1	47.20	1888	18.5; 98.5
Error (a)	0.05	2	0.025		
Total factor B	107.8434	17			
Treatment period	48.40	2	24.20**	1512.5	4.26; 8.64
Interaction AxB	12.03	2	6.025**	376.56	4.26; 8.64

Table 2

The setting in order of the PEF technological variants according to the tartaric stability of the wines

Position	White wines		Red wines	
	Variant	Ts (ºC)	Variant	Ts (ºC)
1	a_1b_1	16.59	a_1b_1	16.50
2	a_1b_2	15.56	a_1b_2	15.10
3	a_2b_1	15.21	a_2b_1	14.73
4	a_1b_3	14.86	a_1b_3	14.37
5	a_2b_2	12.84	a_2b_2	12.66
6	a_2b_3	9.93	a_2b_3	8.85

Table 3

The influence of the PEF technological variants on the proteic stability of the wines, by considering the percentage of the engendered proteic precipitate

Variability cause	SP	GL	s^2	Sample F	
				calculated	theoretical
White wines					
Total factor A	1.48	5			
Repetitions	0.27	2			
Pulse generation source	0.76	1	0.76	3.37	18.5; 98.5
Error (a)	0.45	2	0.225		
Total factor B	77.7828	17	4.57		
Treatment period	68.05	2	34.025**	82.99	4.26; 8.64
Interaction AxB	72.12	2	36.06**	87.95	4.26; 8.64
Error (b)	3.31	8	0.41		
Red wines					
Total factor A	48.38	5			
Repetitions	3.66	2			
Pulse generation source	43.87	1	43.87*	103.22	18.5; 98.5
Error (a)	0.85	2	0.425		
Total factor B	147.3850	17			
Treatment period	90	2	45**	52.17	4.26; 8.64
Interaction AxB	2.10	2	1.05	1.22	4.26; 8.64

Table 4

The setting in order of the PEF technological variants according to the proteic stability of the wines

Position	White wines		Red wines	
	Variant	Proteic precipitate (%)	Variant	Proteic precipitate (%)
1	a_1b_3	12.60	a_2b_3	12.30
2	a_2b_3	12.13	a_2b_2	11.00
3	a_1b_2	11.40	a_1b_3	10.10
4	a_2b_2	9.97	a_2b_1	7.43
5	a_2b_1	8.00	a_1b_2	7.17
6	a_1b_1	7.33	a_1b_1	4.00

Table 5

The influence of the PEF technological variants on the microbiological stability of the wines, by considering UFC/ml

Variability cause	SP	GL	s^2	Sample F	
				calculated	theoretical
White wines					
Total factor A	4706.78	5			
Repetitions	2987.30	2			
Pulse generation source	1718.74	1	1718.74**	4645.24	18.5; 98.5
Error (a)	0.74	2	0.37		
Total factor B	36284.9517	17			
Treatment period	29738.12	2	14869.06**	76.07	4.26; 8.64
Interaction AxB	276.31	2	238.155	1.22	4.26; 8.64
Error (b)	1563.75	8	195.47		
Red wines					
Total factor A	22968.80	5			
Repetitions	4231.21	2			
Pulse generation source	17539.40	1	17539.40*	29.28	18.5; 98.5
Error (a)	1198.19	2	599.095		
Total factor B	68248.57	17			
Treatment period	42873.09	2	21436.545**	113.32	4.26; 8.64
Interaction AxB	893.41	2	446.705	2.36	4.26; 8.64

Table 6

The setting in order of the PEF technological variants according to the microbiological stability of the wines

Position	White wines		Red wines	
	Variant	UFC/ml	Variant	UFC/ml
1	a_1b_1	113.33	a_1b_1	166.67
2	a_2b_1	90.00	a_2b_1	113.33
3	a_1b_2	45.00	a_1b_2	93.33
4	a_2b_2	18.33	a1b3	51.67
5	a_1b_3	9.67	a_2b_2	11.00
6	a_2b_3	1.04	a_2b_3	0.40

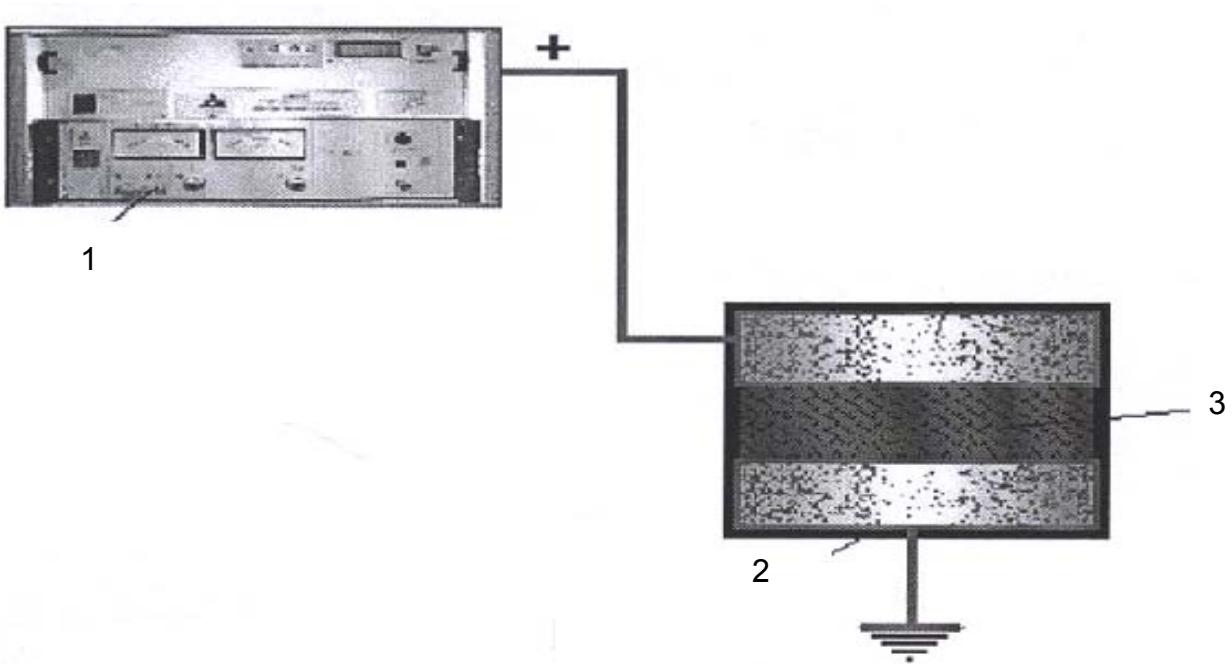

Fig. 1. Laboratory equipment used for PEF treatment application

Lucrări ştiinţifice U.Ş.M.A.V.B., Seria B, Vol. L, 2007

BOTANY & PHYSIOLOGY

CONSIDERATIONS REGARDING THE DEVELOPMENT OF SOME PHYSIOLOGICAL PROCESSES OF OPEN FIELD CULTIVATED TOMATOES PHOTOSYNTHESIS AND RESPIRATION

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Keywords: tomatoes, physiological processes, photosynthesis, respiration, open field culture

SUMMARY

In the experiments made on field cultivated crop tomatoes („Dacia" cultivar) realized in 12 fertilization variants, in the interval 1998-2000, the main objective was evidencing the particularities of the physiological functions for the plants, in the climatic conditions and soil conditions specific for Buzau area. The presented results are theoretically and practically useful, contributing to the better knowledge upon physiological tomato plants reaction to ambiental/environmental factors during their growth and development period.
Photosynthesis and respiration, as fundamental physiological processes are very important for assuring the vegetative growth and the generative evolution of tomato plants. The dependence of photosynthesis on plants' age proved to be considerably low when compared to the dependence on environmental factors. The intensity of photosynthesis and respiration for open field cultivated tomatoes, presented different values, depending also on the degree of plants' fertilization with nitrogen and potassium. This way, at analyzing the average values noted for the 12 variants, it has been observed that plant's photosynthesis has mainly been stimulated through nitrogen fertilization, and also the intensity of respiration has grown.
Of course, an intense physiological activity of plants manifested mainly through the growth in intensity of photosynthesis, involves also increasing respiration intensity, between the two fundamental processes being established an interdependence connection.

INTRODUCTION

Global researches regarding the physiological and biochemical processes of vegetable plants are numerous. Tomatoes occupy a main position among the vegetable crops. In Romania they occupy about ¼ of the open field vegetable surface and ¾ of the protected one, often representing basic biological material in global scale realized studies and experiments. *Cooper (1967)* established that through supplementary illuminating of the tomato transplants, which during winter (without supplementary illumination) accumulate only 14 g/m^2/week and during summer 78 g/m^2 , the growth and maturation of fruits will be accelerated with about 20 days, obtaining a production profit of 20-40%. Whit the same purpose, *C.T. de Witt* studied the correlations between respiration and the crop *(1958),* between photosynthesis and the leaves canopy *(1965)* and also the physiological potential of the tomato crops.

The particularities of the main physiological indicators for open field cultivated tomatoes, in different ecological areas, have to be studied in order to know the way in which tomato plants use the existent ecological conditions in order to get a superior weight of their mass as yielding production and potential production.

Through the carried on research the dynamics of this process was observed on decades, along with other parameters which could offer useful information regarding the way the crop is formed and the possibility of optimizing these results for obtaining a superior economic reaction, materialized through earlier obtained and higher productions. The created data base and the quantification of these indicators in the framework of the existent simulating

programs (SIMTOM, 1995), allow both anticipating the medium and real basis of the production and a correct simulation of the tomato production.

Photosynthesis as a fundamental physiological process is very important for assuring vegetative growth and the generative evolution of the tomato plants. Through photosynthesis, more concretely through net photosynthesis, both the plastic substances necessary for maintaining vital processes and spare substances, mainly deposited in the fruits, are assured. The respiration of plants is also a fundamental process, which mainly depends on the environment level of temperature (by day, by night).

RESEARCH METHODS AND MATERIAL

Tomato seeds (*Solanum lycopersicum* L./sin. *Lycopersicon esculentum* Mill./sin. *Lycopersicon lycopersicum* (L.) Karst et Farwell) – ''Dacia" species designed for industrialization, (semitardive, with determined growth, homologated at I.C.D.L.F. Vidra in 1988), have been sown during the 10^{th} -20^{th} of March, in the cold greenhouse in rows, in a nutritive bed made of manure - 3 parts, fallow soil - 2 parts and sand -1 part, at 5 cm distance between rows and 1,5 cm on the row, the used quantity of seeds was of 5 g/m^2 , obtaining about 1400 plantlets per m^2 . The mixture covering the seeds, 0,5 cm thick, was made of manure - 2 parts and sand - 1 part. Subsequently the plants now in the "small cross" phase (2 real leaves) have been transplanted during the 10^{th} -20^{th} of April, at 7x5 cm in the nutritive bed, obtaining about 280 plantlets/m^2. The transplants were prepared for being planted during a week, through progressive reduction of the temperature with 1-2 ^oC day and night, by intense ventilation and a slight reduction of the substratum's humidity.

During the three years of experimentation, the culture was established with vigorous, illness and pest free transplants, of 45-50 days old from sprouting, during the 10^{th} -20^{th} of May (14.05.1998, 17.05.1999, respectively 16.05.2000), according to the climatic conditions of the year and area (Table 1), following the plantation schema (70+70)/2 x 33 cm in zigzag, with a thickness of 40-50 thousand plants per hectare. For taking care of the non-palisaded crop, the recommendations from frame technology were applied, the specialized work consisting of applying fractionalized fertilizer doses and cropping the fruits, repeated 4 times, within the 12 experimental variants.

Table 1. Phenologic data for open field cultivated tomatoes

Phenologic phase	S.C.D.L. Buzau
Planting date	10-20 V
Starting to bloom	18-28 V
Fruit maturation	8-18 VII

The initial degree of the soil's supply presented close to standard values for organic material (2,58%) and N (0,11%), but also big differences for P_{EA} (150) and K_{EA} (275) (table 2). Fertilizing doses of N were comprised between 100 and 300 kg ha^{-1}, and those of K_2O between75 and 150 kg ha^{-1} .

Table 2. Soil fertility

Cropping area	Soil type and fertility				
	Soil type	Humus, %	Total N, %	P_{EA}	K_{EA}
Buzau	Alluvial	2,58	0,11	150	275

The experience was of a bifactorial type (A*B), placed in subdivided parcels, comprising (table 3):

- factor A = N dose (s.a./ha) – from ammonium nitrate – with 4 graduations;
- factor B = K_2O dose (s.a./ha) – from potassic salt – with 3 graduations.

The balance between photosynthesis and respiration represents the fundamental source for accumulating plastic substances in plants. Both the processes of quantitative growth and the qualitative processes, namely those of the development of ripening points, finally manifested through the ripening potential of the plants, depend on it. This is why, the intensity of the photosynthesis has been registered, on decades, through determining the quantity of organic substance synthesized in a certain interval of time, on the surface unit (the Sachs method, modified), expressed in mg C/dm^2 leaf/hour, and respiration intensity (RI - cm^3 CO_2/g/h), (through Boysen – Jensen). At the same time, there were made determinations of the climatic and microclimatic indicators in the crop at 4 characteristic levels, (2m in the air, at the level of growing plant's top points, at soil level and 10 cm deep in the soil) for a right evaluation of the obtained result.

Temperatures have been registered for the interval May-September, during which the vegetation of open field cultivated tomatoes was comprised. In the analyzed period (1998-2000) the thermic potential of the Buzau area expressed through the sum of active temperatures (>0°C) was of 3169,5°C (table 4), the monthly average temperatures of above 20,5°C, the average maximum temperature (July) of 30,6°C.

Table 3. Experimental variants

Potassium doses (from potassic salt) K_2O (s.a.)	**Nitrogen doses (from ammonium nitrate) N (s.a.):**			
	N – 0	**N – 100**	**N – 200**	**N – 300**
K_2O – 0	1	2	3	4
K_2O – 75	5	6	7	8
K_2O – 150	9	10	11	12

The precipitations during the interval May-September, were relatively abundant in Buzau (277.3 mm), different from one year to the other, with uneven distribution, the quantity of precipitations was insufficient in 1998 and 2000 and superfluous in 1999 (441.2 mm/m^2).

Table 4. The ecological potential of the Buzau area (average values, 1998-2000)

Climatic indices	**Months**					**Sum or average**
	May	**June**	**July**	**August**	**September**	
Active temperatures sum > 0 (°C)	526,4	664,7	752,2	717,7	508,5	3169,5
Monthly average temperature – air (°C)	17,0	22,2	24,3	23,2	17,0	20,7
Monthly average maximum temperature - air (°C)	23,5	28,6	30,7	30,2	23,0	27,2
Monthly average sum of the precipitations (mm)	35,7	90,7	26,8	51,3	74,4	278,9
Sun shine period (hours)	258,0	287,5	335,1	306,2	171,6	1358,3
Precipitations (mm/mp)	34,1	90,7	26,8	51,3	74,4	277,3

OBTAINED RESULTS

PHOTOSYNTHESIS INTENSITY (PI, mg C/ dm^2 . h)

From the determinations made during the vegetation period, at an interval of about 10 days, in the period 1998-2000, it has been determined that photosynthesis intensity registered a large variability of biological and environmental factors. Because of this large variability, the correlation between the photosynthesis intensity and the period of time from the duration

of vegetation the plant went through has been very much reduced, meaning, in the same time, that the dependence of the photosynthesis on the plants' age was more reduced than that upon the environmental factors. Generally, though, a slight decrease has been observed in the photosynthesis during the final period of vegetation (table 5).

Table 5. The effect of nitrogen and potassium fertilization upon photosynthesis for open field cultivated tomatoes, at four terms during vegetation (medium values1998-2000)
Average Values Saturation Light Net Assimilation Rate (NAR max)- Net Assimilation Rate in the morning (NAR) (NAR max - NAR)

Specification	Date	Day*	Fertilization doses						
			Nitrogen doses				Potassium doses		
			N 0	N 100	N 200	N 300	K_2O 0	K_2O 75	K_2O 150
Photosynthesis intensity in mg C/dm^2.h.	20 June	171	344,9	363,9	674,7	486,9	577,9	418,3	406,6
	20 July	201	332,9	527,0	380,3	448,4	448,4	410,8	383,8
	10 Aug	222	253,5	412,0	163,5	230,6	323,5	239,1	232,1
	28 Sept	271	180,0	252,0	268,7	203,2	197,7	133,1	287,4
Photosynthesis intensity in % față de Mt.	20 June	171	*100*	*105,5*	*195,6*	*141,2*	*100*	*72,4*	*70,4*
	20 July	201	*100*	*158,3*	*114,2*	*134,7*	*100*	*91,6*	*85,6*
	10 Aug.	222	*100*	*162,5*	*64,5*	*91,0*	*100*	*73,9*	*71,7*
	28 Sept.	271	*100*	*140,0*	*149,3*	*112,9*	*100*	*67,3*	*145,4*

* Day= Iulian days, from the 1st of January

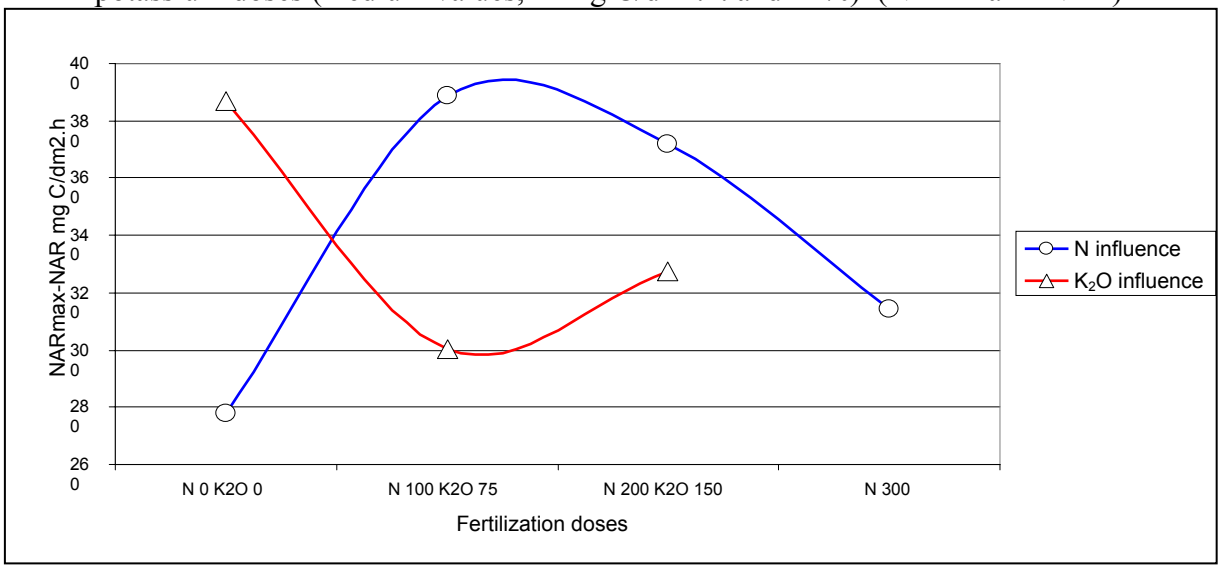
The intensity of the photosynthesis for open field cultivated tomatoes presented differentiated values also depending on plants' fertilization with nitrogen and potassium. Therefore, analyzing the average values registered for the 12 variants, it can be observed that the photosynthesis of the plant was stimulated especially through nitrogen fertilization. This stimulating effect can be explained by the fact that through nitrogen fertilization vegetative growth is intensified; new leaves are formed, with superior dimensions, which contribute to the global photosynthesis of the plant. Compared with the witness variant, through fertilization an average increase of the photosynthesis with 13,9% was registered. For the variants upon which the dose N-100 was used the increase was of 11,2 – 79,0%, for N-200 the increase was of 16,0% - 42,3%, and for the variant upon which the largest amount of nitrogen was used (N-300), the increase of the photosynthesis was of 25,9% (Tab. 6).

Table 6. Nitrogen and Potassium doses effect on Photosynthesis intensity (PI) of tomatoes (medium values), in mg C/dm^2.h. compared with the witness variant (average values)
Average Values Saturation Light Net Assimilation Rate (NAR max) - Net Assimilation Rate in the morning (NAR) (NAR max - NAR)

Specification	Potassium doses	Nitrogen doses					Differences
		N 0	N 100	N 200	N 300	Average	%
Differences from witness mg C/dm^2.h.	K_2O 0	296,9	531,5	422,5	296,6	386,9	114,4
	K_2O 75	253,6	330,3	344,4	273,1	300,3	88,8
	K_2O 150	283,0	304,4	348,5	373,9	327,4	96,8
	Average	277,8	388,7	371,8	314,5	**338,2**	100
	Differences, %	82,1	114,9	109,9	93,0	100	
Differences from witness in %	K_2O 0	***100***	*179,0*	*142,3*	*99,9*	130,3	114,4
	K_2O 75	*85,4*	*111,2*	*116,0*	*92,0*	101,2	88,8
	K_2O 150	*95,3*	*102,5*	*117,4*	*125,9*	110,3	96,8
	Average	93,6	130,9	125,2	105,9	**113,9**	100
	Differences, %	82,1	114,9	109,9	93,0	100	

When analyzing the global effect of nitrogen and potassium fertilization on photosynthesis, it was observed that applying nitrogen determined an important increase in comparison with applying potassium. Therefore, in comparison with the non-fertilized variant, when applying N-100 dose the photosynthesis intensity increased with about 39,9%, for N-200 there was a 33,8% increase, and for N-300 photosynthesis increased with 13,2% (Fig. 1). In the same experimental conditions, for fertilization with K_2O-75 there was a decrease in photosynthesis of 22,4% and for the dose K_2O -150 photosynthesis intensity dropped 15,4% (Fig. 1).

Fig. 1. Level and tendency of PI in open field cultivated tomatoes, depending on nitrogen and potassium doses (medium values, in mg C/dm^2.h. and in %) (NAR max - NAR)



The above mentioned data certify that through fertilization of open field cultivated tomatoes, mainly with nitrogen, the photosynthetic intensity and the productive capacity of the plants will increase.

RESPIRATION INTENSITY (RI, cm^3 CO_2/g.h)

As a result of determining the respiration intensity during the vegetation period, at intervals of about 10 days, a strong variability was noticed, determined especially by the climatic conditions. (Tab.7).

Table 7. The effect of nitrogen and potassium fertilization upon respiration intensity for open field cultivated tomatoes, at four terms during vegetation (medium values 1998-2000)

Specification	Date	Day*	Fertilization doses						
			Nitrogen doses				Potassium doses		
			N 0	N 100	N 200	N 300	K_2O 0	K_2O 75	K_2O 150
RSI in cm^3 CO_2/g.h.	20.iun.	171	1,185	0,942	1,249	1,238	1,037	1,149	1,275
	20.iul.	201	0,544	0,620	0,663	0,874	0,591	0,744	0,692
	10.aug.	222	0,574	0,518	0,655	0,766	0,480	0,573	0,834
	28.sept.	271	1,376	1,039	1,267	1,222	1,174	1,493	1,011
RSI in % from witness variant	20.iun.	171	*100*	*79,5*	*105,5*	*104,5*	*100*	*110,8*	*123,0*
	20.iul.	201	*100*	*114,1*	*122,0*	*160,8*	*100*	*126,0*	*117,1*
	10.aug.	222	*100*	*90,3*	*114,2*	*133,5*	*100*	*119,4*	*173,8*
	28.sept.	271	*100*	*75,5*	*92,1*	*88,8*	*100*	*127,1*	*86,1*

* Day= Iulian days, from the 1st of January

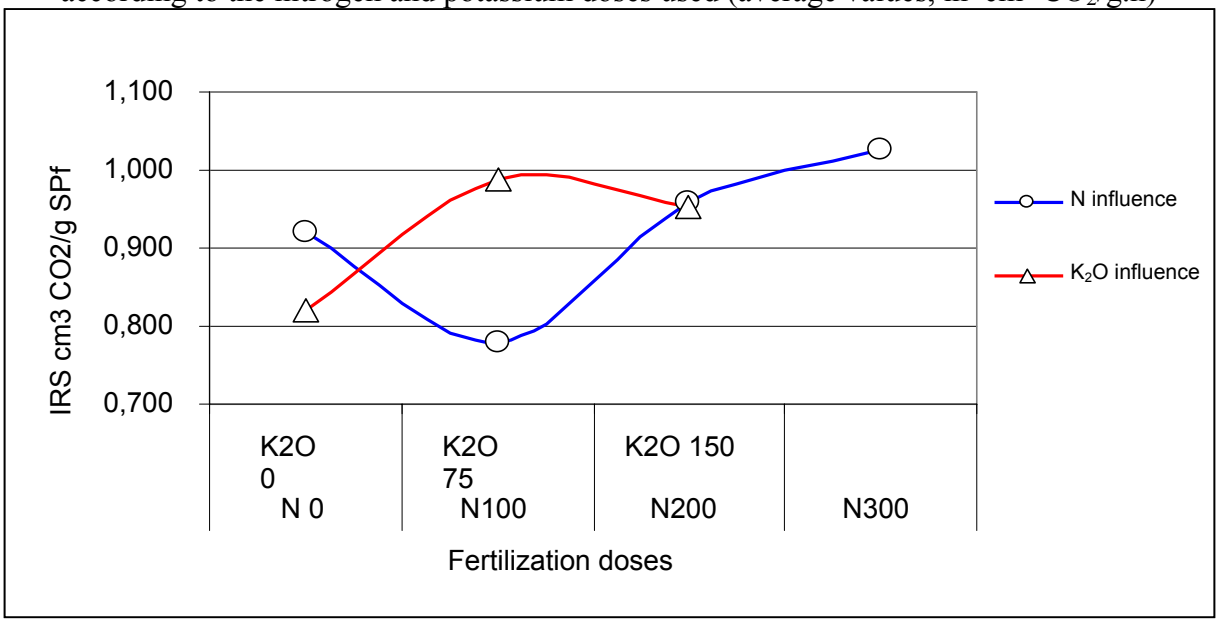
Between respiration intensity and the age of plants, there was established, as in the case of plants, a rather weak correlation. In the same time, a tendency of diminishing respiration intensity in the second part of the vegetation period was observed, followed by a slight increase when leaves reach senescence. Compared with the witness variant, through fertilization, respiration intensity grew with about 34,7%. When applying N-100 dose respiration intensity increased with 2,4 … 26,0%, for N-200 there was a 24,8% ... 60,9% increase, and for N-300 respiration increased with 41,4…59,3% (table 8).

Table 8. The effect of nitrogen and potassium doses upon respiration intensity for tomatoes (average values), in cm^3 CO_2/g.h. relative to the witness (average values 1998-2000)

Specification	Potassium doses	Nitrogen doses					
		N 0	N 100	N 200	N 300	Average	Differences, %
Differences from witness in cm^3 CO_2/g.h.	K_2O 0	0.684	0.778	0.853	0.967	0.820	89.1
	K_2O 75	1.245	0.700	0.923	1.089	0.989	107.4
	K_2O 150	0.830	0.862	1.100	1.020	0.953	103.5
	Average	0.920	0.780	0.959	1.025	**0.921**	100
	Differences, %	99.9	84.7	104.1	111.3	100	
Differences from witness in %.	K_2O 0	***100***	*113.7*	*124.8*	*141.4*	120.0	89.1
	K_2O 75	*182.0*	*102.4*	*135.0*	*159.3*	144.7	107.4
	K_2O 150	*121.4*	*126.0*	*160.9*	*149.1*	139.4	103.5
	Average	134.5	114.0	140.2	149.9	**134.7**	100
	Differences, %	99.9	84.7	104.1	111.3	100	

Therefore, in comparison with the non-fertilized variant, when applying N-200 dose the respiration intensity increased with about 4.3%, and for N-300 there was an 11.5% increase (Fig. 2).

Fig. 2. The level and tendency of respiration intensity for open field cultivated tomatoes, according to the nitrogen and potassium doses used (average values, in cm^3 CO_2/g.h)



In the same experimental conditions, for fertilization with K_2O-75 there was an increase in respiration of about 20.6% and for the dose K_2O -150 respiration intensity increased with 16.2% (Fig. 2). On the basis of the registered data, there can be observed that

respiration intensity was favourably influenced both through nitrogen fertilization and potassium fertilization. Of course intense physiological activity for the plants, manifested mainly as through photosynthesis increase, also presupposes an increase in respiration, the two fundamental processes being interdependent.

CONCLUSIONS

1. Compared with the average value (100%), photosynthesis intensity in the case of the non-fertilized variants (N-0) was of only 82,1%, of 114,9% for N-100, of 109,9% for N – 200 and of 93,0% for N - 300. When compared with nitrogen, potassium's effect upon photosynthesis proved to be more reduced, differences, reported to 100%, being of 88,8% for K2O 75, respectively 96,8% for the doses of K2O – 150.
2. From analyzing the possible effect of fertilization upon respiration intensity, on the basis of the 12 experimental variants, it resulted that through applying nitrogen and potassium an average increase of 34,7% in respiration intensity was determined.
3. For the variants upon which N-300, the maximum dose, was applied, reported to 100% in comparison with the average, the differences in respiration intensity increase were of 11,3%, for N-200 the increase was of 4,1% and for N-100 a decrease was registered, the difference being of 15,3%. The effect of potassium upon respiration intensity seems obvious for both fertilization doses, the positive differences relative to the average being of 7,4% for the doses of K_2O – 75, respectively 3,5% for K_2O -150.

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SOME PHYSIOLOGICAL AND ELEMENTAL COMPOSITION FEATURE OF RICE SEEDS UNDER BROWN SPOT INCIDENCE

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ABSTRACT

Rice is grown worldwide and is the primary or secondary staple food for 50% of the world population. Seed germination represents a fundamental aspect in the plant life-cycle and in the crop yield and high seed quality is an obligate start for efficient crop production, being determined by factors such as purity, percentage and uniform germination, vigour, storability and pathological condition of a seed lot. On the other hand, nutritional qualities depend also on the mineral elements seeds composition.
The aim of our studies was to investigate some physiological and nutritional seeds quality features under the brown spot *Cochlibolus miyabeanus* (Ito and Kuribayanski) Dreschler ex Dastur [anamorph*: Bipolaris oryzae* (Breda de Haan) Shoemaker] incidence.
One cultivar (sound and affected seeds) was used to evaluate the fungus impact on cell membrane stability during seeds germination, by electrolyte leakage of seeds and seedlings and five cultivars were used to determine the fungus impact on minerals content. Samples were analyzed by inductively coupled spectroscopy (ICP). All rice cv. were obtained from the Rice Study Center Chirnogi.
The electrolyte leakage was highest at the early stages of seeds imbibitions, with a mean values higher by 1,57 in the case of affected seeds, as compared with the healthy ones and declined gradually thereafter. After the imbibitions period, electrolyte leakage for the affected seeds was by 1,46 higher as against the control. Also, it can be noticed small differences due to the year, in relation with the disease severity degree. Rice seeds with the lowest electrolyte leakage values had the highest percentage of germination and vigorously seedlings.
Generally speaking it can be noticed higher minerals content in the case of affected seeds and in the same time the content of elements varies between rice cultivars. There are also variations in concentration of related elements, first at all as a consequence of the different cultivar, second due to the growing season and the third factor was the fungus impact degree.

INTRODUCTION

Rice is grown worldwide and is the primary or secondary staple food for 50% of the world population. It is a nutrition grain crop which contains carbohydrates, proteins, lipids, also is an important source of essential minerals. Rice straw is an important animal feed in many countries. Thus, it is one of the most important plants on earth, so, researches concerning rice seeds nutritional and physiological quality are in progress.

Seed germination represents a fundamental aspect in the plant life-cycle and in the crop yield and high seed quality is an obligate start for efficient crop production being determined by factors such as purity, percentage and uniform germination, vigour, storability and pathological condition of a seed lot. Also, at the cell level functional membranes are a prerequisite for cell viability and efficient metabolism. For instance, the plasmalemma and tonoplast are essential for compartmentalization of internal constituents and the mitochondrial membrane is required for respiration and electron transport (Goodwin and Mercer, 1983).

On the other hand, nutritional quality depends also on the mineral elements seeds composition. Genetic transformation of rice was started in late 1980s and the traits reported in recent successful transformations follow his trend, including pest and disease resistance, herbicide tolerance and specific grain quality. From this perspective there are preoccupations to improve rice seeds iron content, taking into consideration that iron deficiency is estimated

to affect about 30% of the world population. Experiments performed by some researchers (Lucca, 2002; Qian-Quan and al., 2006), with a view to increase iron content in rice endosperm, showed that this rice with higher iron content, rich in phytase and cysteine-peptide has a great potential to substantially improve iron nutrition in those population where iron deficiency is so widely spread. A high -iron, high - zinc rice line, designed IR68-144 which is aromatic, high -yielding and disease resistant, has been identified by the International Rice Research Institute in the Philippines (Bouis, 2001).

The aim of our studies was those to investigate some physiological and nutritional seeds quality features under the brown spot *Cochlibolus miyabeanus* (Ito and Kuribayanski) Dreschler ex Dastur [anamorph: *Bipolaris oryzae* (Breda de Haan) Shoemaker] incidence, which is a seed borne that can survive on infected rice straw and stubble and spread from plant to plant in the field by airborne spores. Brown spot is one of the most important rice diseases that can adversely affect the yield and milling quality of the grain (Rashed and al., 2002).

MATERIALS AND METHODS

One rice cultivar (Chirnogi) was used in the experiments regarding seeds physiological quality. For germination and seedlings vigour studies seeds were germinated in the dark, at 25^0C, on wet filter paper moistened with distillate water, in Petri dishes. To evaluate cell membrane stability there were determined electrolyte leakage of seeds and seedlings by electrolyte conductivity. Seeds or seedlings were placed in a baker containing 20 ml distillate water and maintained at 25^0C for 3.5 h, and conductivity of the solution was measured (OK- 102 conductivity meter type). After autoclaved samples for 20 minutes and cooling to room temperature, conductivity was measured again. The so called permeability index was estimated as a ratio between electrolyte leakage (EL) and total electrolytes content (TE).

The following variants have been used to study elemental seeds composition: 1 - Polizesti 28 sound; 2- Polizesti 28 affected; 3- Zefir s.; 4- Zefir a.; 5- Magic s.; 6- Magic a.; 7- Elida s.; 8- Elida a.; 9- Chirnogi 2005 s.; 10- Chirnogi 2005 a.; 11- Chirnogi 2006 s.; 12- Chirnogi 2006 a. The fresh weight of the samples was determined, and then the samples were dried at 105^0C for 24 h. The dry weight content was calculated as the percentage of fresh weight. For elemental analysis of rice seeds dried samples ached at 550^0C, digested in concentrated nitric acid for 30 minutes and diluted with bi distillate water. Samples were analyzed at ICP (Inductively coupled plasma spectroscopy). Husted and al., (2004) have previously been demonstrated that inductively coupled plasma mass spectroscopy, isotope-ratio mass spectroscopy and multivariate statistics can offer an elemental fingerprint analysis of barley (*Hordeum vulgare*).

RESULTS AND DISCUSSIONS

Impact of brown spot incidence on physiological seed quality expressed by membrane stability parameters during germination is presented in *Table 1*. Electrolyte leakage for the affected seeds was 1,77 times higher than the healthy seeds (2005) and 1,38 times higher (2006) after 3 hours of imbibitions. The same evolution it was noticed after imbibitions period. Permeability index values follow the approximately the same trend, even if the total electrolyte content was not markantly different.

Influence of brown spot on seeds physiological features, such as membrane reorganization during imbibitions period had a remarkable impact to seedling vigor and data presented in Table 2 confirm these statements (*Table 2*). Stem length of rice seedlings was

significantly reduced by the fungus incidence. Rice seeds with the lowest electrolyte leakage values had the highest percentage of germination and normal seedlings. Our study indicating an accelerated leakage of electrolytes in the case of the affected seeds as previous findings indicated a strong connections between electrolyte leakage through damaged cell membranes (Delian and al., 2004), as well as a consequence of environmental stress impact in rice (Agarie and al., 1995).

Also, seed nutrient content has previously been shown to affect seedling growth, competitive ability and adult biomass and seed production too. Fresh seed weight and dry weight content are presented in *Figure 1* and *Figure 2*. As we can see, there are small differences between cultivars, and there were no significant differences between these genotypes as regard as seeds fresh weight, excepting Polizesti 28 cv.. Also, there are no significantly differences between variants regarding seeds dry mass, water and mineral substances (*Figure 2*).

Data presented in *Table 3* show variations in concentration of related elements, first at all as a consequence of the different cultivar, second due to the fungus impact degree and the third factor was the growing season. Some elements are in higher amount in the affected seeds, especially Na and P (30.63 as compared with 14.81; 481.15 as compared with 431.18 - Polizesti 28). If we look to the obtained values ranges, it can be concluded that mineral content in studied rice cultivars is high in phosphorous and potassium, the values range from 414.05 to 431.18, respectively from 330.6 to 571.43. These data are according with those presented in the literature for wild rice. Generally speaking it can be observed higher minerals content in the case of affected seeds by the fungus *Cochliobolus* and in the same time the content of elements varies between rice cultivar. Most of affected seeds were almost husk, and similarly results have been obtained by Van Tran and Teherani (1988) for Rb, Fe, Ni, and Cr, the content being significantly higher in rice husk, than in rice seed.

Rice is an important source of essential minerals; however, due to a number of factors the bio-availability of these minerals is limited. Investigations of the variation of phytic acid, iron and zinc levels in 56 varieties of Chinese rice, collected in proportion to the importance of rice -growing regions of China, showed the biggest variation (9-45 mg kg^{-1}) for Fe level. Zn showed a moderate variability (13-39 mg kg^{-1}), as correlated with phytic acid content and showed a relation with growing region and kernel shape (Jianfen and al., 2007). Authors interpreted these results in terms of expected bio-availability and concluded that there is a scope for optimization of mineral content of rice by matching suitable varieties and growing regions, and that rice products require processing that retains minerals but results in thorough dephytinisation. In most cereal crops, phytic acid is the main storage form of phosphorous, which can decrease the bioavailability of phosphate and transgenic expression of pytase is regarded as an efficient way to release phosphate from phytase in transgenic plants (Qiao-Quan and al., 2006).

CONCLUSIONS

In summary, it might be conclude that under brown spot incidence rice seeds physiological and nutritional characteristics have been negatively affected.

The highest value of the permeability index registered for the affected seeds has been demonstrated to significantly reduce seedling vigour. Rice seeds with the lowest electrolyte leakage values had the highest percentage of germination and vigorously seedlings.

It was noticed higher minerals content in the case of affected seeds, especially for Na and in the same time the content of elements varies between rice cultivar. There are also variations in concentration of related elements, first at all as a consequence of the different cultivar, second due to fungus impact degree.

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Tables

Table 1. Rice seeds membrane permeability measurements
(s-sound seeds; a-affected seeds)

Experimental variant	Electrolyte leakage after 3 h (µS/g/20 ml H_2O)	Electrolyte leakage after imbibitions period (µS/g/20 ml H_2O)	Total electrolyte content (µS/g/20 ml H_2O)	Permeability index (EL/TE)
Chirnogi 2005 s.	144,29	324,65	1104,72	0,1306
Chirnogi 2005 a.	256,16	541,32	1474,14	0,1738
Chirnogi 2006 s.	243,26	468,44	1139,05	0,2136
Chirnogi 2006 a.	336,95	591,76	1218,32	0,2766

Table 2. Impact of brown spot on rice seedling vigour

Experimental variants	Seedling fresh weight (mg plant^{-1}) (DAI - day after seeds imbibitions)				Root length (cm plant^{-1})	Shoot length (cm plant^{-1})
	5 DAI	6 DAI	7DAI	8DAI	7DAI	7DAI
Chirnogi 2005 s.	65	70	73	77	3,25	1,60
Chirnogi 2005 a.	55	61	63	68	1,65	2,10
Chirnogi 2006 s.	50	53	59	66	2,75	1,25
Chirnogi 2006 a.	46	51	62	66	1,65	1,10

Table 3. Some mineral elements content of rice seeds (sound or affected by the brown spot)

Sample	Mineral elements (mg/100 g dry weight)								
	Al	B	Ca	K	Mg	Na	P	Pb	Zn
Polizesti 28 s.	1,62	3,63	19,48	387,48	112,23	14,81	431,18	0,75	1,89
Polizesti 28 a.	2,62	4,72	27,90	***571,43***	119,10	30,63	481,15	0,56	0,12
Zefir s.	0,73	6,24	14,91	359,57	107,29	7,20	431,79	0,21	0,48
Zefir a.	1,61	3,27	15,50	451,73	105,21	23,10	422,45	0,28	0,40
Magic s.	1,56	4,11	14,46	381,83	99,39	15,36	***414,05***	0,44	-
Magic a.	1,40	4,45	11,30	492,77	104,77	20,21	433,18	0,60	-
Elida s.	0,98	3,89	8,27	342,11	106,97	10,88	434,00	0,34	0,02
Elida a.	2,43	3,84	12,25	376,81	106,37	18,45	425,07	0,44	0,02
Chirnogi 2005 s.	2,07	3,56	8,86	357,49	117,80	13,7	479,42	0,28	0,07
Chirnogi 2005 a.	1,15	3,65	20,61	366,26	123,18	20,90	***501,62***	0,25	0,23
Chirnogi 2006 s.	1,67	4,06	15,83	390,86	105,92	13,78	468,49	0,30	-
Chirnogi 2006 a.	2,11	3,92	11,14	***330,61***	112,27	20,35	443,68	0,84	0,70

Figures

Figure 1. Variation of the rice (sound and diseased) seeds cultivars fresh weight

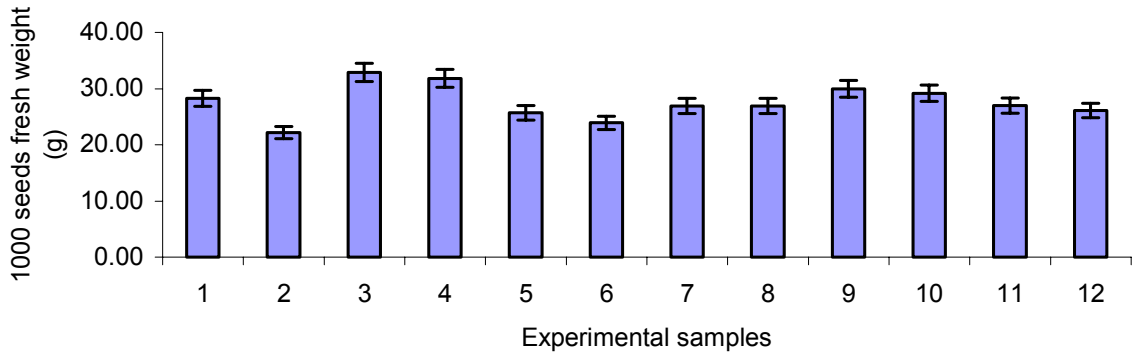
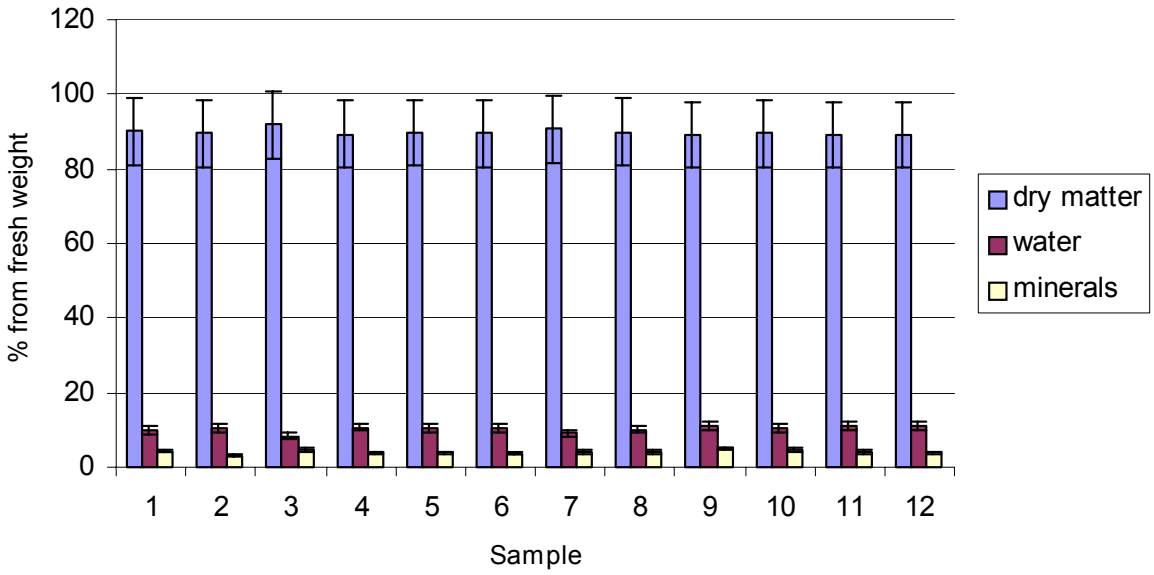


Figure 2. Variation of rice dry mass, water and minerals



Lucrări ştiinţifice U.S.A.M.V.B., Seria B, Vol. L, 2007

STUDIES REGARDING TOTAL PHENOLS CONTENT IN DIFFERENT APPLE CULTIVARS AND HYBRIDS

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Keywords: apple varieties, hybrids, phenols

ABSTRACT

Apples belong to the main fruit species, the most important fruit in temperate zone and the main objectives of apple breeding are being pursued in a number of breeding stations. These main objectives include fruit quality, resistance to biotic stresses, environmental adaptability, enhanced bearing through changes in tree habit, fruit characteristics and yield efficiency, and constancy of production.
An important focus in apple breeding is resistance to apple scab and as concerning the preformed and induced biochemical barriers, phenols are very important. In this context, the content of total phenols was studied in 8 apple cultivars and 12 apples hybrids, growing at S.C.D.P.Voinesti (2006, 2007). The total phenols contents were determined by using the Folin-Ciocalteau assay and results were expressed as mg gallic acid equivalents (GAE) /100 g fresh weight. The amount of total phenols in leaves was markedly higher than in fruits peel or fruits mezocarp and there were registered significantly differences between variants. Also, there were registered significantly differences between registered values for this two years determinations.

INTRODUCTION

Plants are exposed to many biotic and abiotic stress factors and understanding the mechanisms of their responses represents a precondition for a sustainable agriculture and for a high crop yield, in the context of the new concept of vital quality. Apples belong to the main fruit species, the most important fruit in the temperate zone, and the main objectives of apple breeding are being pursued in a number of breeding stations, worldwide, also in Romania. These objectives include fruit quality, resistance to biotic stresses, environmental adaptability, changes in tree habit, fruiting characteristics and yield efficiency, and constancy of production (Gradinaru et al., 2002; Coman et. al, 2005; Sansavini et. al., 2005 a.; Delalieux et. al., 2005; Lakso et al., 2006; Massonnet et al., 2006). Besides size, shape, colour and taste of the fruit, a new quality parameter is becoming more and more popular- a bioactivity of the fruit and its health promoting effect for the consumer (Schirrmacher et Schempp, 2003).

Apples are famously good for us. How often have heard that "an apple a day keeps the doctor away"? How many benefits apples offer? The range is truly impressive (Dvorkin, 2007). The European market for fresh apples is the most extensive in the world; so, the best strategy for the European fruit sector is to promote quality, security and sustainability of the production system (Stich et al., 2005).

As concerning the preformed and induced biochemical barriers, *phenols* are very important. In fact, ten years ago, Gutmann said that in the near future, development on photochemical based on phenols lead with broad activity spectra against common pathogens is one of the most promising strategies. The resistance to *Venturia inaequalis* is related to the accumulation of phenolic compounds at the infection site and literature data mentioned that in apple leaves and fruit skin a positive correlation between phenol content and predisposition to apple scab has been established. Lux-Endrich et al. (2002) studied response of apple cell suspension cultures cv. Alkmene on elicitation with biotic elicitors and formation of novel

flavonoids was reported by Roemmelt et al. (2002) in apple treated with prohexadione-Ca, substance which is known to reduce the incidence and severity of fire blight caused by *Erwinia amylovora* and other plant diseases.

Taking into consideration the connection between the constitutive plant resistance against pathogens and the positive role as antioxidants in the cellular metabolism and senescence, the content of total phenols content was studied in 8 apple cultivars and 12 hybrids, growing at S.C.D.P.Voinesti.

MATERIAL AND METHODS

The biological material (leaves and fruits) was obtained from S.C.D.P.Voinesti. The leaf samples were collected in June (2006, 2007) and fruits at the same moment in June as for leaves and at two moments (beginning of September 2006 and late in August 2007).

Total phenols were extracted in methanol 80% and determined by using the adjusted Folin-Ciocalteau assay, colorimetrically at 765 nm. The standard curve was plotted using gallic acid (Sigma) as standard. Total phenolics were expressed as mg gallic acid equivalents (GAE) /100 g fresh weight. Average results were obtained by two parallel determinations.

RESULTS AND DISCUSSIONS

Summary obtained results are presented in Figures 1- 4. Total phenols content in leaves ranged in June 2006 from 599.2 (Ciprian) to 1042,4 (95/52), with a mean value of 822,96. Comparatively, values registered in June 2007 were markantly higher (Figure 1). These ranged from 856,86 (95/55) to 2441,52 (95/272), with a mean value of 1685,49, so, we can see a markant increase of leaves phenols, about two or three times. For instance, the content of gallic acid in the leaves of the variants 95/272 was almost three times as high as in the remaining variants. The comparison of the content of gallic acid in leaves of different apple cultivars and hybrids showed a statistically relevant trend especially for June 2007. Mayr et al. (1994) established that it was impossible to find out how much was the content of phenolic compounds in a plant influenced by a particular stress factor since it is the result of mutual effects of all stress and other environmental factors. In our case, the higher temperatures in 2007 could be one inductive factor for enhance phenols synthesis.

Comparatively to the apple leaves, phenols content in fruits peel was markantly lower, as we can observed in Figure 2 and Figure 3. The average values were 354.91 (June 2006) with the lowest value for Ciprian (159.1) and the highest one for Redix (547.6). In June 2007 the values range from 360.31 (Ciprian) to 2265.85 (95/52) with a mean value of 1029.22. So, it can be noticed the same trend as in the case o apple leaves (with significantly higher value in 2007), but values in the peel are about two times smaller than in leaves.

The average content of gallic acid in apple peel and pulp was determined at fine of August (2007) and in fruit peel at beginning of September. Presented data emphasized that the total phenols was generally decreased in peel. The lowest value was 215.1 (Generos, 2006) and the higher 1020 (95/49 -2006). In 2007, the values range from 26.89 (Generos) to 315.5 (95/52) with an average of 177.92. So, the apple peel phenols content was significantly lower in 2007, probably in relation with the environmental condition referring especially to the temperature effect. The accumulation of products was lower as the assimilation process was probably the same.

As regard as the resistance genes of resistant apples genotypes, Michalek et. al (1999) mentioned that they possible act as regulatory genes of phenols synthesis. Phenols are always present in conjugated form, usually with glycosidic attachment. They may be released in the free form during the fungal infection or insect grazing through enzymatic or other hydrolysis.

In such cases they are likely to be much more toxic to the invading organism than the bound form. On the other hand Singler and Stösser (1990) did not find a close correlation between the occurrence and/or distribution of phenolic substances in the epi- or hypodermal fruit cells and scab susceptibility of different cultivars.

A new quality parameter is becoming more and more popular, a bioactivity of the fruit and its health promoting effect for the consumer. Our results emphasized that in apple fruits mezocarp the phenols content was under 100, the lower values being registered for Ciprian (14.7) and the higher for 98/72 (98/72). It can be mentioned that the samples had not the same maturity degree, but of course the differences are due mainly in relation with their genetically specifically characteristics, also by fruit development and solar radiation. Interesting fact for results obtained by was that the contribution of the fruit pulp fraction to the total ORAC activity of fruit was less than 10% (Lachman et al., 2006).

Next to the benefits effect of phenols, it is necessary to considered the amelioration programs according to people preferences, which are different: American/European *dessert apples* ('Golden Delicious'); *European refreshing apples* (**'**Granny Smith'); *Asian dessert apples* ('Fuji') or *JFC,* high quality apples, excellent combination of juicy firm and crispy flesh (JFC), sweetness and high acid content ('Braeburn) (Sansavini et. al., 2005 b.). The consumers prefer fruits with gentler taste which exhibit lower content of some groups of phenolics.

There is a conviction that the apple of the future may take on nutraceutical functions proper to foods that can improve health as well as prevent illness and even enhance cell metabolism by rapping free radicals so as to delay cell ageing. A good level of polyphenols like procyanidine also helps to strengthen the plant's self-defence system against pathogens, although too high an expression results in an adverse change of taste. Cultivars with a high level of this polyphenol include 'Granny Smith' and 'Braeburn' (over 2400 mg/kg), as compared to 'Golden Delicious' (1200 mg) (Guyot et al., 2002).

The breeding and planting of scab resistant cultivars of apples should be encouraged, but cannot be relied on exclusively because the resistance will probably be overcome in time. Also, in Romania there are recent results concerning new columnar apple variety with genetic resistance to apple scab (Braniste et al., 2005). During 2000-2005, at Maracineni- Pitesti Research Institute, there were created new apple cultivars with the gene of apple scab resistance, such as Romus 5, Nicol and Rebra (Coman, 2005). This attribute is under constant threat from changes in the virulence pattern of the pathogen and many of the varieties in current use have resistance originating from *Malus floribunda*. The apparition of new fungus forms in our country have been determined some years, more virulent forms (Delian, 1998), also resistance forms to the fungicides (Delian and Alexandri, 1992). New races have recently been registered (Parisi et al., 2000; Bus et. al., 2005).

The use of new biotech tools should accelerate the development of novel varieties while saving time and reducing work loads. Indeed, several stations have already introduced marker assisted selection (MAS) for monogenic traits and QTLs are increasingly important in segregating polygenic traits. Genomics is an area that is increasingly important for studies of gene expression targeted to such traits as fruiting, abiotic and biotic stress resistance, tree and bearing habit (Sansavini et al., 2005,b.).

CONCLUSIONS

Total phenols content was significantly higher in apple leaves as compared with fruits peel or fruits mesocarp. These range from 599.2 (Ciprian) to 1042.4 (95/52) (2006). Comparatively, values registered in June 2007 were about two or three times higher.

For the fruits peel, the lowest value was registered for Ciprian (159.1) and the highest one for Redix (547.6). In June 2007 the values were significantly higher (range from 360.31 - Ciprian to 2265.85 -95/52). Late in summer and at the beginning of autumn the lowest registered value was 215.1 (Generos, 2006) and the highest one 1020 (95/49 -2006). In 2007, the values range from 26.89 (Generos) to 315.5 (95/52) So, the apple peel phenols content was significantly lower in 2007, probably in relation with the environmental condition, referring especially to the temperature effect on assimilation.

Apple fruits mezocarp had lower phenols content as compared with leaves and fruits peel, with values situated under 100. The lowest value was registered for Ciprian (14.7) and the highest for 98/72 (93.13), in relation with the genotypes and the specifically maturity degree.

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Figures

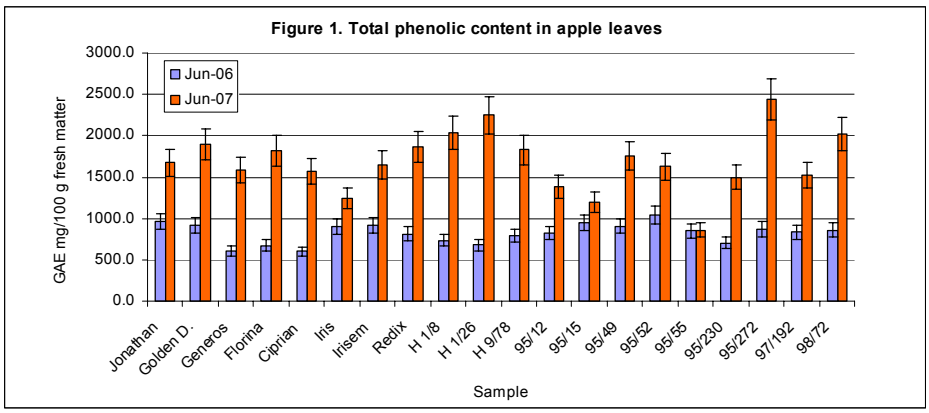
Figure 1. Total phenolic content in apple leaves
GAE mg/100 g fresh matter
3000.0
2500.0
2000.0
1500.0
1000.0
500.0
0.0
Jun-06
Jun-07
Jonathan
Golden D.
Generos
Florina
Ciprian
Iris
Irisem
Redix
H 1/8
H 1/26
H 9/78
95/12
95/15
95/49
95/52
95/55
95/230
95/272
97/192
98/72
Sample

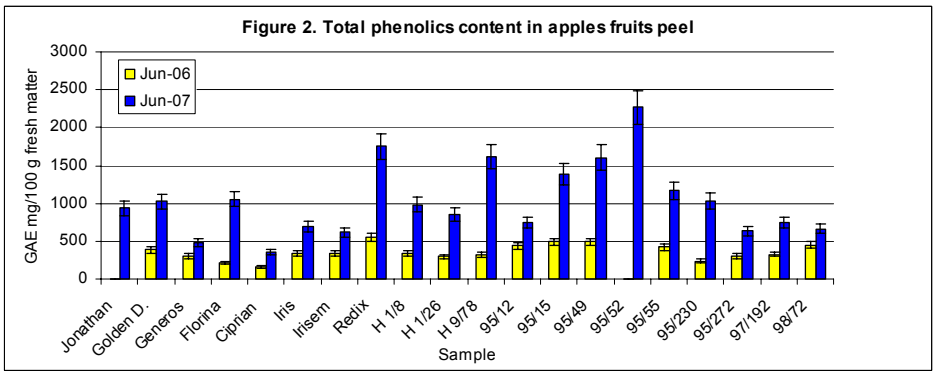
Figure 2. Total phenolics content in apples fruits peel
GAE mg/100 g fresh matter
3000
2500
2000
1500
1000
500
0
Jun-06
Jun-07
Jonathan
Golden D.
Generos
Florina
Ciprian
Iris
Irisem
Redix
H 1/8
H 1/26
H 9/78
95/12
95/15
95/49
95/52
95/55
95/230
95/272
97/192
98/72
Sample

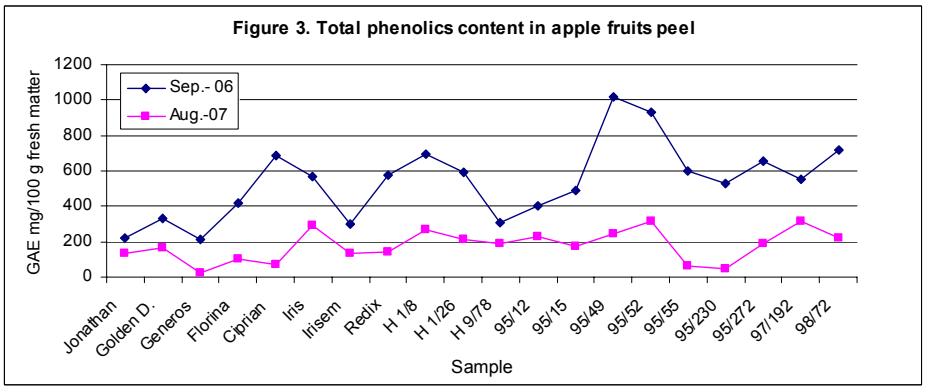
Figure 3. Total phenolics content in apple fruits peel
GAE mg/100 g fresh matter
1200
1000
800
600
400
200
0
Sep.- 06
Aug.-07
Jonathan
Golden D.
Generos
Florina
Ciprian
Iris
Irisem
Redix
H 1/8
H 1/26
H 9/78
95/12
95/15
95/49
95/52
95/55
95/230
95/272
97/192
98/72
Sample

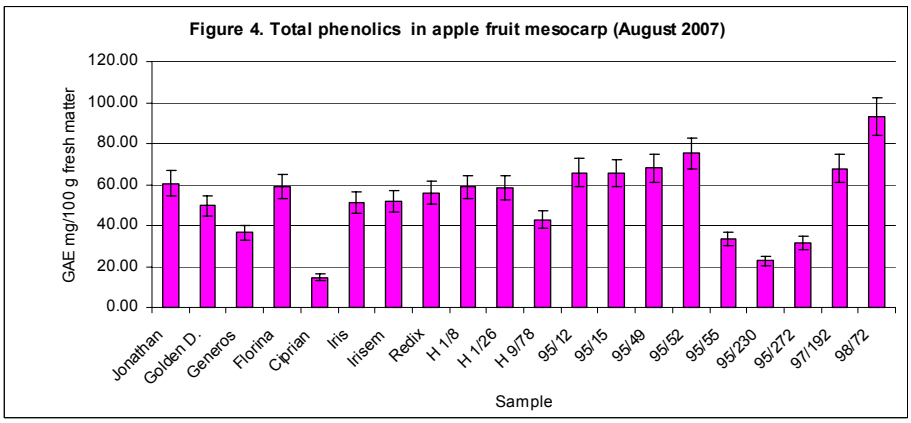
Figure 4. Total phenolics in apple fruit mesocarp (August 2007)
GAE mg/100 g fresh matter
120.00
100.00
80.00
60.00
40.00
20.00
0.00
Jonathan
Golden D.
Generos
Florina
Ciprian
Iris
Irisem
Redix
H 1/8
H 1/26
H 9/78
95/12
95/15
95/49
95/52
95/55
95/230
95/272
97/192
98/72
Sample

Lucrări ştiinţifice U.S.A.M.V.B., Seria B, Vol. L, 2007

COMPARATIVELY STUDY OF THE ESSENTIAL OILS COMPOUNDS FROM SIX *THYMUS* SPECIES CULTIVATED IN ROMANIA

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Keywords: essential oils, leaves, *Thymus*

ABSTRACT

Summarised research data emphasised a different composition for the six studied *Thymus* species, as following: *Thymus calliari* contains 17.66 (%) trans ocimen; *Thymus comosus* contains 14.26 (%) β- cayophyllene: *Thyms glabrescens* presents 47.92 (%) carvacrol and 36.04 (%) g- terpinene. *Thymus panonicus* had a high amount of α terpenil acetate. Also, in *Thymus pulegoides* the essential oils are rich in carvacrol, while in *Thymus zigioides* there were identified in a high amount camfen and α- pinene.

MATERIAL AND METHODS

The researches have been performed on herbal of six *Thymus* species from wild flora of Dobrogea (*Thymus zigioides*), Bucharest (*Thymus glabrescens*) and Bucegi regions (*Thymus calliari* and *Thymus comosus*).

The essential oils were extracted by hydrodistillation with a Singer Nickerson apparatus. The separation and identification of the compounds were crried out using a gas chromatograph Agilent, equipped with a masspectrometric detector. There was used a capillary column DB 5 (length of 25 m, internal diameter of 0.25 mm) and helium as carrying-gas; the internal temperature as 60^0C and the thermal gradient was 4^oC/min till the end temperature of 280^0C. The NIST spectra bank was used to identify the essential oils, which were verified with the Kovats indices.

RESULTS AND DISCUSSIONS

Following studies of the obtained chromatograms for those six *Thymus* species generally the essential oils composition comprised 16-36 volatile compounds. Summarised data are resented in *Table 1* and reflect differences between species, as regard as the presented essential oils. In *Thymus calliari* there have been identified 27 essential oils compounds , with an appreciable amount in he case of trans-ocymene (17.66 %), followed by linalool (11.60 %), trans nerolidol (4.34 %) and d- cadinen (3.07 %).

As regard as *Thymus comosus* composition, our research emphasised 28 essential oils represented in principal by β- caryophyllene (14.27 %), germacren (10.73 %), spatulenol (7.10 %) and α- cadinol (7.96 %).

For *Thymus glabrescens*, from 16 identified essential oils in higher amount there were carvacrol (47.92 %) and g-terpinene (36.04 %). In the case of *Thymus panonicus*, from 30 identified compounds there were remarked α-terpinil acetate (48.83 %) and germacren D (12.12). For *Thymus pulegoides* there were identified 32 compounds, from these carvacrol had the highest amount (34.09 %), followed by thymol (15.27 %), p-cymene (13.82 %) and β-cymene (11.09 %).

From those six *Thymus* analysed species, the higher numbers of essential oils compounds there were identified in *Thyus zigioides* (36 compounds), with an appreciable amount being kamfen (20.93 %), α- pinene (11.87 %), cis β-ocymene (8.91 %) and limonene (7.36 %).

Analysing the obtained results, it can be noticed a variable essential oils composition for the studied species, also the presence of limonene for every studied species. Limonene amount is different from one to another specie, this compound being present in *Thymus callari* (4.71 %), *Thymus comosus* (5.35 %), *Thymus glabrescens* (0.46 %), *Thymus panonicus* (2.69 %), *Thymus pulegoides* (0.45 %) and *Thymus zigioides* (7.36 %).

It is very interesting that some substances are present only in some species, such as: β-cineol; allocymene; β cubebene; β- farnesole; α- murrolene; γ- gurjolene; trans -nerolidol; α-elemen. These compounds there were identified only in *Thymus calliari* specie. For *Thymus comosus* the specifically compounds were cubenol and α- cadinol. Limonene oxide and izocaryophyllene there were present only in the case *of Thymus glabrescens*. Cis - geraniol, trans-geranil, neril acetate, izoaromadendren epoxide were compounds identified only in *Thymus panonicus*. B-cymene, thymol metil eter, thymol are characteristic compounds for *Thymus pulegoides* and for *Thymus zigioides* the characteristic compound is carotol (in a very small amount - 0.20 %).

CONCLUSIONS

1. Studies performed on *Thymus* species herbal emphasised the carvacrol presence in a relatively high amount (47.92 % and 34.09 %) for *Thymus glabrescens* and *Thymys pulegoides*.
2. *Thymus glabrescens* and *Thymus pulegoides* ca be recommended as medicinally plants, being known the carvacrole antimicrobian, antioxidant and antiseptic effect.
3. Kamfen presence in *Thymus zigioides* herbal has an antioxidant, expectorant and pesticide activity.
4. *Thymus comosus* can be recommended due to its antibacterial, sedative, pesticide activity of the contained β- caryophyllene.
5. *Thymus panonicus* is recommended to be used as an aromatizing due to its α- terpinil acetate content.

ACKNOWLEDGEMENTS

To National Authority for Scientifically Research (ANCS)

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Table 1. Th chemical composition of the essential oils extracted from six *Thymus* species

	***Thymus calliari* Bucharest**	***Thymus comosus* Bucharest**	***Thymus glabrescens***	***Thymus panonicus***	***Thymus pulegoids***	***Thymus zigioides***
α-thujen			1.45		1.53	0.63
Triciclene						0.74
α-pinene	5.64	0.61	1.03		0.62	11.87
Camphene	7.57	1.04		0.16	0.37	20.93
Sabinene			0.52	0.34		0.58
β-pinene	2.16		1.60		0.17	2.08
Octen-3-ol					1.09	0.69
Octanona					0.23	
Myrcene	8.55	2.46		4.73	1.57	1.11
3-octanal					0.23	
α-terpinene			3.09		1.65	0.19
Cymene		0.77	6.75			
β-cymene					11.09	
p-cymene				0.59	13.82	0.28
Limonene	4.71	5.35	0.46	2.69	0.45	7.36
β-cineol	4.21					
Trans- β-ocymene	17.66	0.87		0.35	0.65	0.69
Cis-β-ocymene		4.18		2.61	0.15	8.91
g-terpinen		2.47	36.04			
Cis-β-terpineol	0.41		0.07			
α- terpineol					0.12	0.31
Linalool	11.60	0.50			0.23	0.24
Allocymene	0.42					
Octenil acetate				1.16		
Camphor	0.63					0.35
Izobomeol	0.63					
Limonene oxide			0.25			
Borneol					0.62	0.59
Terpinen-4-ol			0.13		0.43	1.01
α-terpineol	0.77			0.44		0.90
Cis-geraniol				0.30		
β-citral				0.89		0.47
Thimol metil eter					3.15	
Thymol metil eter izomer					3.70	
Thymol					15.27	
Trans-geraniol				1.46		
α-citral				1.20		0.78
α-terpinil acetate				48.83	0.10	
Bornil acetate	0.82	1.22				0.18
Carvacrol		0.57	47.92		34.09	
d-elemen	0.43					
Geranil acetate	0.68	0.32		0.51		0.65
Neril acetate				2.21		
β-burbonen		0.90		0.98		0.85

β-elemen		0.69		0.58		0.57
Timil acetate			0.12		0.17	
β-cubeben	1.93					
β-caryophyllen	0.93	14.27		1.32	4.63	3.51
α-caryophyllene		2.46			0.16	
izocaryophyllene			0.16			
β-farnesane	1.80					
Alloaromadendren	1.7	1.69				0.54
α-murrolen	0.14					
Germacren-D	3.40	10.73		12.12	0.59	6.49
r-element		3.40			0.23	10.62
β-bisabolen		1.60	0.16	1.14	1.13	
r-gurjunen	1.42					
r-murrolen	2.69			0.30		
d-cadinen	3.07	3.81		0.69	0.14	0.18
Elemol		0.35				1.98
Spatulenol		7.10		2.29	0.31	3.12
Caryophyllene oxide		1.95	0.10	6.35	0.74	1.23
Globulol						0.47
Ent-spatulenol				0.36		
Cubenol		0.69				
Trans-nerolidol	4.34					
d-cadinol	3.37	7.96				
Tau-murrolol	1.47			0.46		
α-cadinol	2.15	1.95		1.09		
Izoaromadendren epoxid				0.53		
Cis-arnesol		0.94				
Trans-farnesol				1.45		
carotol						0.22

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THE RESPIRATION DYNAMICS OF SUBAQUATIC PLANTS CAUSED BY HEAVY METAL'S POLLUTION

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Key words: heavy metals, pollution, respiration

SUMMARY

In this report we study the influence of different cadmium concentrates on the respiration intensity, under dynamic condition, over a period of approximately two months, on the plants of *Ceratophyllum sp*. The biological material was harvested from the Arges River's nearby lakes, from submerged areas. The cadmium concentration was between 0.003 – 0.06 ppm Cd^{+2}. It remarks a positive correlation between the days of exposure to the cadmium concentration and the respiration values.

INTRODUCTION

The heavy metals are acting differently against the plants; some of them cannot bear the toxicity and are doomed to die while others (*Ceratophyllum sp., Myriophyllum sp., Potamogeton sp., Vallisneria sp., Elodea sp., Phragmites sp., Typha sp., Nymphaea sp., Nuphar sp., Schoenoplectus lacustris, Agrostis sp.* etc.) have the role to purify the heavy metal polluted waters (nevertheless in tolerable concentrations that not affect the vital functions). Therefore, in this report we study the influence of different cadmium concentrates on the respiration intensity, under dynamic condition, over a period of approximately two months, on the plants of *Ceratophyllum sp*.

MATERIALS AND METHODS

In this paper work we present our research regarding the changes in the respiration process at the *Ceratophyllum sp*. plants under the action of different cadmium concentrates.

Ceratophyllum sp. plants were harvested from the Arges River's nearby lakes, from submerged areas.

Experimental variants are presented in table 1.

Table 1.

Experimental variants

VARIANTS	CADMIUM CONCENTRATION
V1	-
V2	0,003 ppm Cd^{+2}
V3	0,01 ppm Cd^{+2}
V4	0,03 ppm Cd^{+2}
V5	0,06 ppm Cd^{+2}

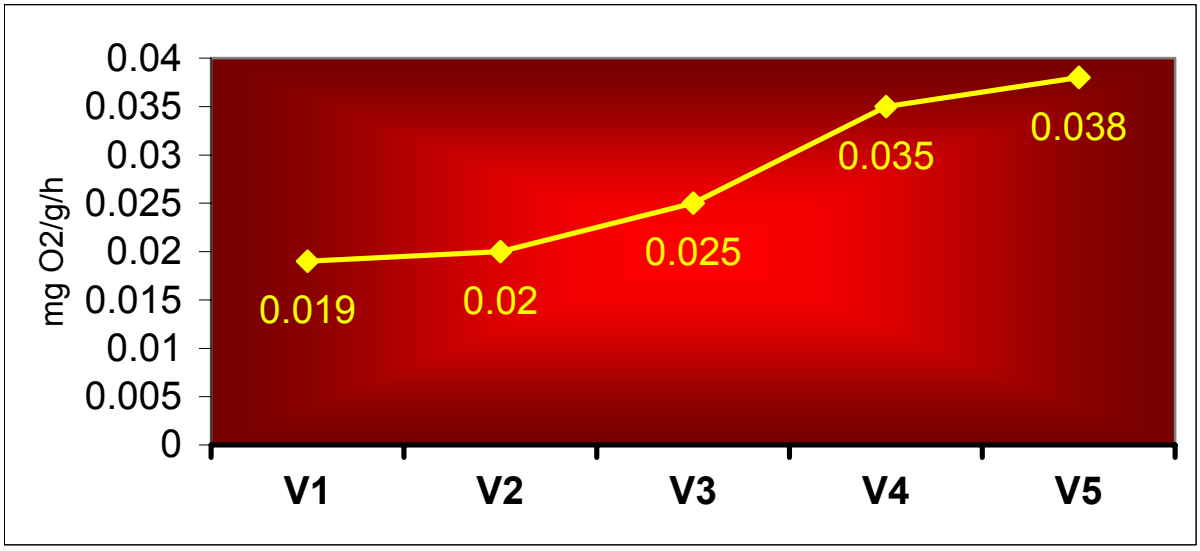
The respiration intensity has been determined under dynamic conditions for *Ceratophyllum sp* plants submerged in cadmium solution for a period of: 7 days, 9 days, 16 days, 21 days, 32 days, 38 days, 40 days and 56 days. The results were graphically illustrated using the Microsoft Excel programme and have been statistically concluded using the SPSS 13,0 programme for Windows using the method of multiple analysis calculation.

RESULTS AND INTERPRETATIONS

Figure no.1 graphically presents the respiration intensity results at *Ceratophyllum sp.* plants in cadmium presence after a period of 7 days. One can see maximum respiration intensity to the variant V5 -0,038 mg O_2/g/h.

Figure 1.

Respiration intensity at *Ceratophyllum sp.* (after 7 days of exposure)



Experiments conducted after 9 days reveals that a cadmium quantity over 0,01 ppm Cd^{+2} intensified the respiration process (0,025 mg O2/g/h) compared with the V1 lot.

From the statistical interpretation of the results after a period of 7 days and 9 days respectively, one can see that there are significant changes in the respiration values for V4 and V5, for a significant difference of $p<0,05$.

Figure 2.

Respiration intensity at *Ceratophyllum sp.* (after 9 days of exposure)

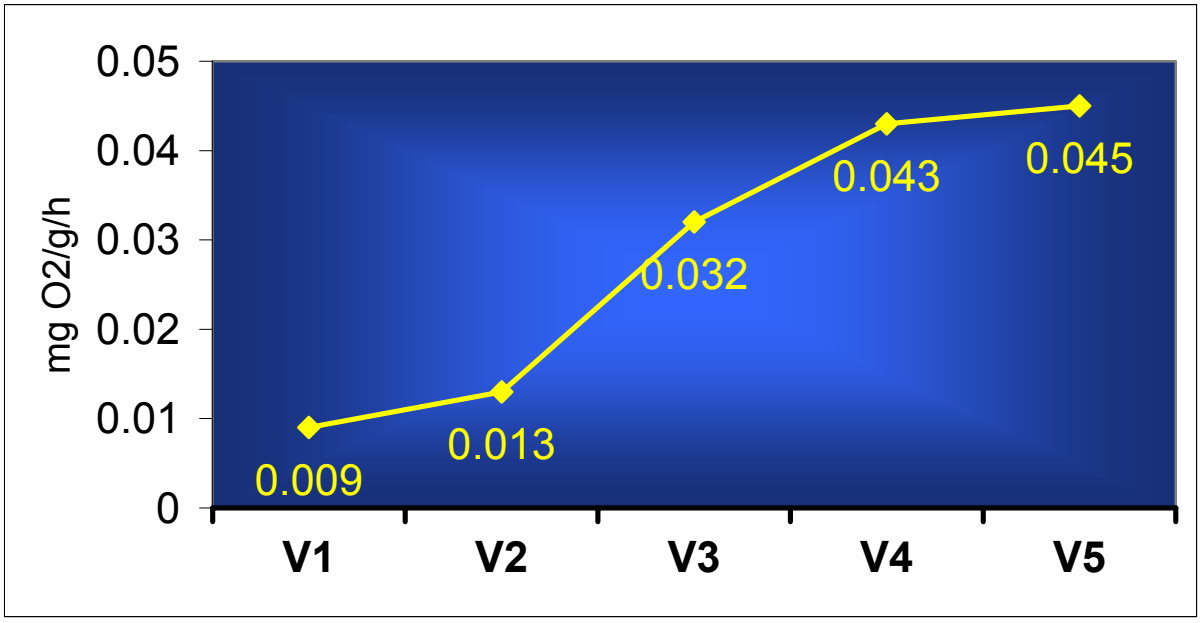
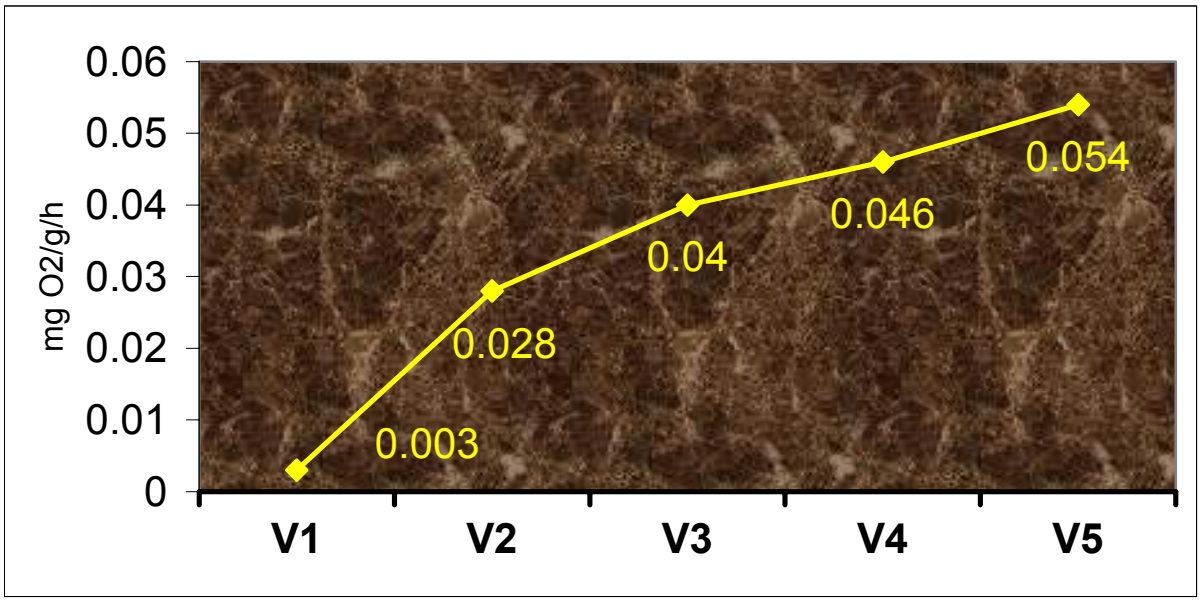


Figure 3.

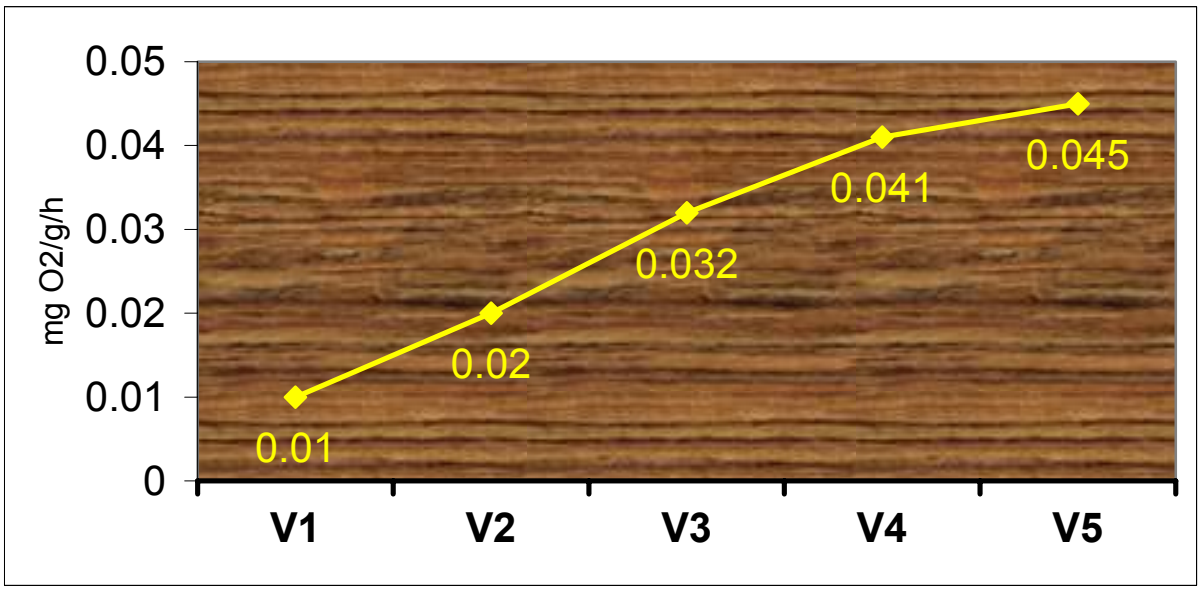
Respiration intensity at *Ceratophyllum sp*. (after 16 days of exposure)



After 16 and 21 days of cadmium influence, it remarks a positive correlation between the days of exposure to the cadmium concentration and the respiration values. In both cases one can see maximum respiration intensity to the variant V5 (0, 06 ppm Cd^{+2}).

Figure 4.

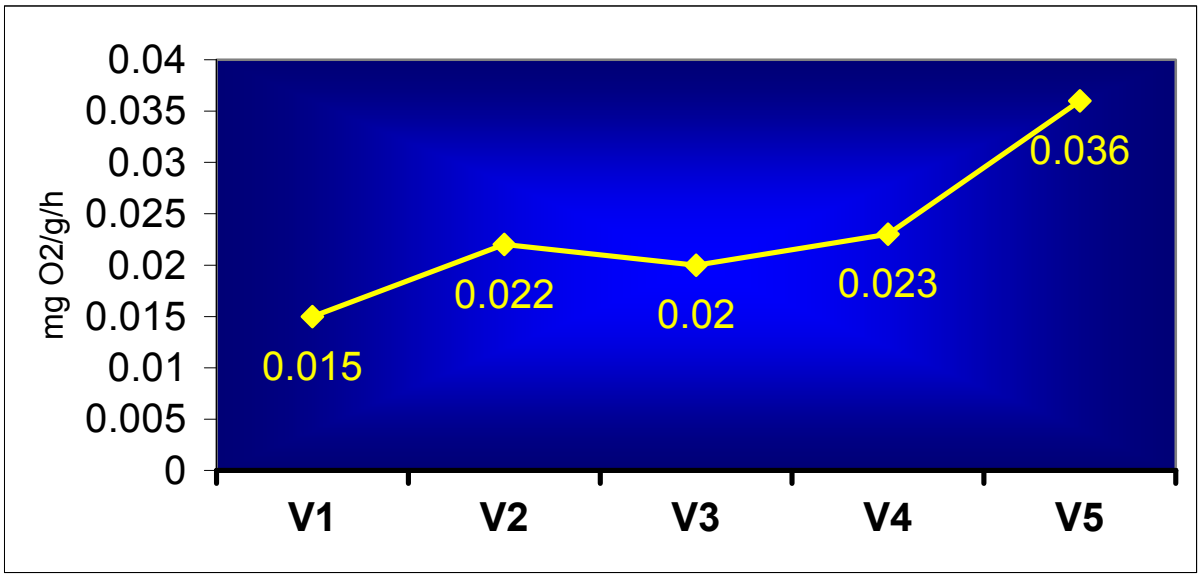
Respiration intensity at *Ceratophyllum sp*. (after 21 days of exposure)



Figures 5 and 6 graphically illustrates the results of the respiration intensity at *Ceratophyllum sp.* plants submerged in different cadmium concentrates after a period of 32 days and 38 days respectively. In both cases one can see an increase in the respiration process for the variant V2, V3, V4 and V5 variants compared with the standard V1.

Figure 5.

Respiration intensity at *Ceratophyllum sp*. (after 32 days of exposure)



Increases of the cadmium concentrate in solution crease the respiration intensity, so, the cadmium presence has a stimulator effect for the respiration process.

The significant differences appear between V1 and V4, V5 variants.

Figure 6.

Respiration intensity at *Ceratophyllum sp*. (after 38 days of exposure)

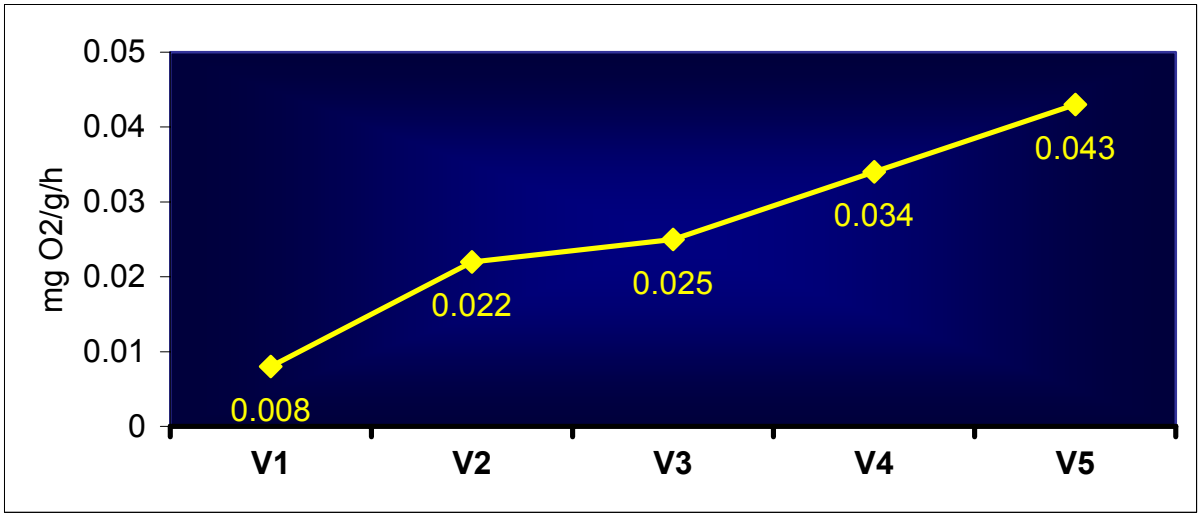


Figure 7.

Respiration intensity at *Ceratophyllum sp*.(after 40 days of exposure)

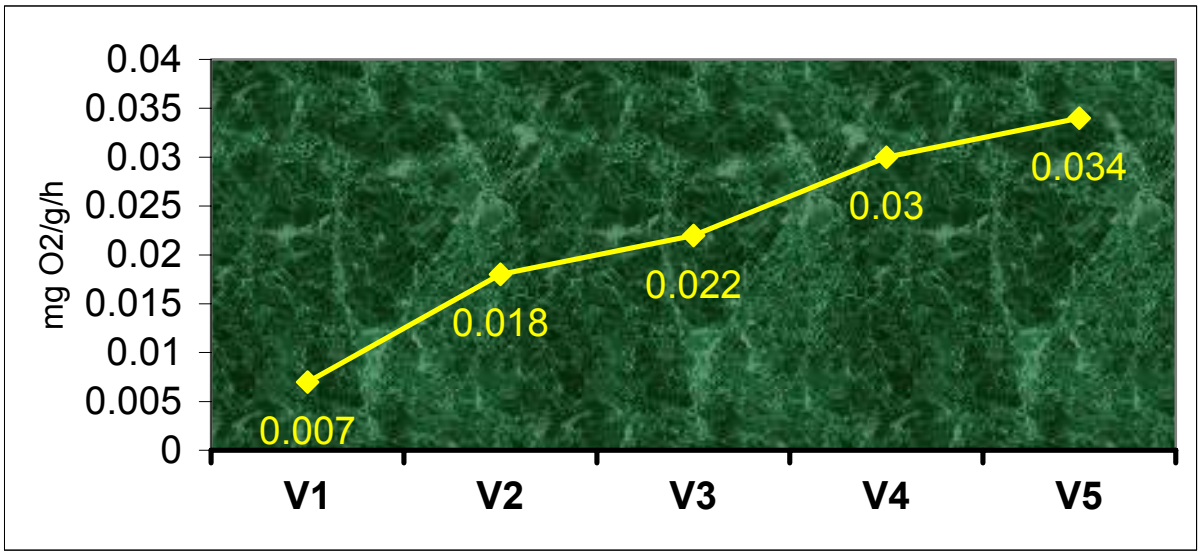
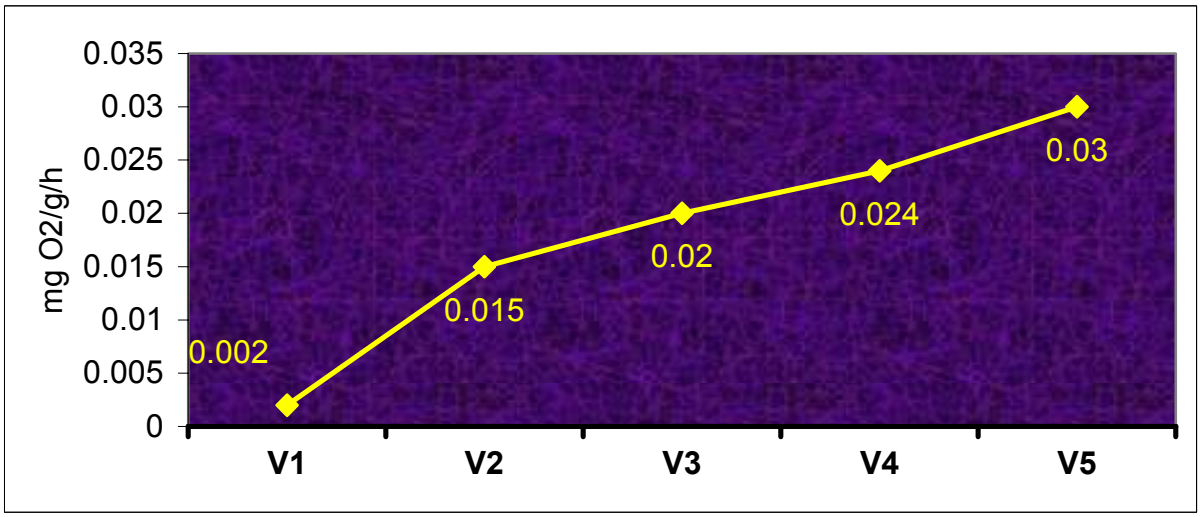


Figure 8.

Respiration intensity at *Ceratophyllum sp*. (after 56 days of exposure)



Graphics 7 and 8 presents the results obtained in the final two experiments (after 40 days and 56 days respectively).The *Ceratophyllum sp* plants are already adapted with the presence of the cadmium in its environment. The maximum respiration value is determined, as in the previous experiments, by the highest concentration of cadmium for the variant V5 (- 0, 06 ppm $Cd^{+2)}$.

CONCLUSIONS

1. Cadmium administrated as cadmium chloride changed the intensity of the respiration process at the aquatic submerged plant of *Ceratophyllum sp.* Increasing the cadmium quantity result in a process of stimulation of the respiration. A concentration of 0,06 ppm Cd^{+2} lead to maximum values of the respiration intensity;
2. *Ceratophyllum sp.* plants manifest an adaptation to the presence of cadmium in solution; after many days of exposure the values of the respiration decrease. The higher values were observed for 16 days of exposure.

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OTHER FIELDS

RESEARCHES REGARDING THE ENDOWMENT WITH TECHNICAL SYSTEMS OF AN AGRICULTURAL BASE OF VEGETAL PRODUCTION

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Key words: agriculture, mechanization, outfit of equipment, improvement

SUMMARY

Acquisition and proper exploitation of technical systems in an agricultural base of vegetal production is a very important activity in order to obtain some steadfast and quality products. It is necessary that every agricultural base to have a suitable number of equipments which would allow the procedures in the best period from the agro technical point of view. The new acquired technique compared to the old one has a series of characteristics that makes it advanced, and these are:

- the real power of tractors, bigger;
- the improvement of the traction performance in the case of agricultural tractors by using advanced engines and transmissions;
- automation of the action systems and of the work processes from agriculture;
- Agricultural machines with large work width and superior efficiency;
- Agricultural machines adapted for different work conditions;
- Agricultural machines that would assure quality indexes for a good work;

INTRODUCTION

Since 2007 Romania is part of the European Union ant this involves the assimilation of agriculture community policy. The community funds are in one place and are relevant that almost half of the present budget of the European Union is for supporting agriculture. Amounts will be allocated in rural development, subsidy for agricultural producers, funds for respecting the environmental conditions.

When all the producers and partners are eligible and follow the community standards regarding foods' safety and sanitary – veterinary and phytosanitary rules, then Romania becomes a real beneficiary of the community funds, and will receive more significant amounts than its contribution to the European Union budget.

Romania's budgetary effort is determined on the base of co financing principles established through the access methodologies to cohesion structural funds of European Union. Romania's contribution to EU's budget is calculated applying a percentage of 1,14 % of Romania's Gross Domestic Product estimated for the level of the period 2007-2009.

The amounts allocated to Romania from the EU budget, for agriculture, rural development, and structural funds will approximately be of 9,8 billion euros. Romania might also benefit an extra 1,1 billion euros, thus the total amount might reach 10,9 billion euros in the period 2007-2009.

A great part of these funds will be used for the endowment of agricultural bases with tractors, machines, agricultural installations.

MATERIAL AND METHOD

An agricultural base of vegetal production was taken for the study, with an area of 5000 ha, placed in the Danube waterside, having soils with a high degree of fertilization. The agricultural base is specialized in large culture for consumption and seed production in the following main cultures: wheat, spring and autumn two row barley, corn, sunflower, soya, rape and so on. Compared to the structure of the cultures from the period 2006-2007, calculations were made; relations for establishing the necessary equipment from the agricultural base were established. It was taken into consideration the fact that in the agricultural base both classical plant cultivation technologies and technologies involving a minimum change of the soil were put into practice.

In order to perfect the activity, technological charts for the present cultures were made and it was also calculated the number of the aggregate necessary in the mechanized work process development.

$$N_{agr} = 1,1S/n_s \; z \; W_h \; T_s$$

Where: S = the area that needs procedures;
n_s = the number of work shifts per day;
z = the number of days needed to do the agricultural procedure;
W = work capacity per hour, ha/h;
T = the time for a shift, h.

In establishing the number of aggregate and of the real charge on an equipment, it was taken into consideration the culture with the largest area from the agricultural procedures (mechanized) point of view or cultures where the mechanized procedures are superposed. Everything began from the real situation of the number of aggregate for each agricultural procedure and the calculation made showed whether this number is or not enough. At the calculation of the number of aggregate some indexes can change for example the number of work shifts and also the area. For this last aspect is important to emphasize that when establishing the structures of the cultures one must take into consideration also the endowment with mechanical equipment.

In establishing the necessary of tractors and agricultural machines for the given agricultural exploitation it was taken into consideration the fact that the whole number of agricultural procedures must be assured in good conditions requested by the technologies. It was taken into consideration the whole complex of elements that depend one on each other, characteristic for the exploitation taken in this study. In their unity, these can be grouped in two big categories:

- elements that influence the structure of the tractor park and of agricultural machines, meaning the type of aggregation to be used in real work conditions;
- elements that influence the necessary number of aggregate of a certain type.

It was also taken into consideration to point out the applied technologies which make evident a main procedure and that is the one concerned with the preparation of the field made so that the conservation of the structure of the soil to be possible. This thing is possible to be realized with basic procedures of the soil without overturning the furrow, with the help of specialized machines of breaking up the soil deep, preparing the field with equipment of great productivity (strong tractors and agricultural machines with great width of work), which can allow both respecting the proper period of execution and the reduction of the number of tours on the field.

The attended area is that maximum area in a top of a campaign, which must be worked by the machine in a proper period from the agro technical point of view.

The optimum charge refers to the productivity made by each equipment, according to the number of shifts per day and the number of days for every equipment when the agricultural procedure must be done. The calculation is the following:

$$\hat{I}_0 = W_{sch} \times n_s \times z_0 \quad \text{(ha/equipment)}$$

Where: W_{sch} = work capacity per shift, ha/sch;
n_s = the number of shifts per day, sch/days;
z = the number of days per equipment, days/ equipment.

The real charge refers to the area that must be worked in a top of a campaign that is due to every equipment. The following calculation is important:

$$\hat{I}_r = S/N_{ru} \text{ (ha/equipment)}$$

Where: S = the attended area by the equipment in a top of a campaign
($S=S_1 +S_2+.....S_n$), ha;
N_{ru} = the real number of equipment used for the same procedure.

RESULTS AND DISCUSSIONS

The agricultural base has an area of 5000 ha, and for the period 2006-2007, approximately 2400 ha of autumn cultures were cultivated and 2500 ha spring cultures. Taking into consideration the real situation regarding the endowment of the base with technical systems, an analysis was made concerning the charge on each equipment, the attended area and the number of equipments.

The structure of the cultures in the already mentioned period is presented in table 1.

Table 1

The structure of the cultures and the estimated productions (2006-2007)

The culture	**Cultivated area**	**The medium estimated production (kg/ha)**
Spring two row barley	661	2800
Sunflower for consumption	664	3000
Corn for consumption	536	7000
Soya (with no genetic changes)	509	2800
Autumn rape	485	1700
Durum wheat (Prowidur)	171	3500
Wheat for consumption	1598	3500
Wheat seed	50	4000
Two row barley for seed	50	3700- cropped
Mustard	100	1500
Sunflower seed	50	1600
Lucerne green fodder	40	15t/scythe

In the period 2004-2007, the agricultural base had an intense program of investments in technical endowments needed for accomplishing the agricultural procedures in the proper periods from an agro technical point of view.

There were bought both agricultural tractors and agricultural machines. Their number, the constructive types and the main characteristics are presented in the following tables.

Table 2

The tractor park of the agricultural base (2007)

Tractor type	Power (CP)	Number of tractors (per pieces)
John Deere tractor	250	3
New Holand tractor	250	2
New Holand tractor	100	1
Renault Tractor	100	1
U 650 tractor	65	4
SV 445 tractor	45	1

Table 3

The agricultural machines' park of the agricultural base (2007)

The type of the agricultural machine	The number of machines (per piece)	Characteristics
Subsoil machine	2	Work width – 2,85m
Vogel Noot plough	5	Number of the bodies of a plough- 7 The width of the body of a plough – 30cm
AP-XTL disk harrow	2	Work width – 6,4m
Combinator	1	Work width – 6,0m
Combinator	1	Work width – 9,0m
RAU Herbicide Machine	1	Work width – 24,0m
RAU Herbicide Machine	1	Work width – 20,0m
VOGEL NOOT Herbicide Machine	1	Work width – 24,0m
MA Fertilization machine-3,5	2	Medium work width– 12,0m
ACCORD Seeding machines for close rows	1	Work width – 4,0m
PNEUMADRIL Seeding machines for close rows	2	Work width – 6,0m
RAU Seeding machines cultivators	2	Number of rows - 8 Work width – 5,6m with 70cm between rows
VOGEL NOOT Seeding machines cultivators	1	Number of rows - 8 Work width – 5,6m with 70cm between rows
Rotative hoes	2	Work width – 4,5m
Clod crushers	1	Work width– 12,0m
CLASS, John DEERE, NEW HOLAND Auto propel combines	4	Medium work width – 6,0m
WARFAMA Ballot cylindrical pressing machine	1	-
RAU cutting reed installation	1	-
Trailers for cereals	6	Capacity – 12,0 t
Irrigation installation with drum	20	-
BAUER Irrigation installation	2	-

The technology with minimum changes of the soil allows obtaining some very important advantages especially in the case of one base with a large area of field. These advantages are represented by:

- the main procedure for the soil without overturning the furrow allows water conservation in the soil
- with a deep breaking up of the soil the reconstruction of the soil structure is made, reconstruction of the air hydria regime of the soil and improvement of the growing conditions of the plants;
- the reduction of soil settling;
- making fuel savings;
- the reduction of labour power;
- the growth of work production and thus, a more considerable value of the profit with direct consequences on salary raise;
- respecting the proper period of execution;
- obtaining some good, quality work indexes.

Table 4

Tractors and agricultural machines' park in the agricultural base

	Equipment	**Number of equipments**	**The attended area for the equipments (ha)**	**The real charge on each equipment (ha/equipment)**	**The optimum charge on each equipment (ha/equipment)**	**Equipment deficit**
1.	Tractors 65CP 100CP 220CP 250CP	 4 2 3 2	 1600	 65 100 220 250	 45 65 150 170	 2 3 1 1
2.	Cereals combine	4	1600	400	330	1
3.	Ploughs 7bodies of plough	5	1600	320	370	-
4.	Disk harrow Combinators	2 2	1600 1600	800 800	660 770	1 1
5.	Scarifiers	2	1600	800	730	1
6.	Cereal sowers of 6 m of 4 m	 2 1	 1600	 450 575	 290 430	 1 1
7.	Cultivator sowers with 8 sections	3	664	220	270	-
8.	Cultivators 9sections 13sections	 3 1	 664	 130 260	 160 280	 - -
9.	Machines for culture protection 20and 24m	3	1600	530	700	-
10.	Fertilization machines 3,5t	3	1600	800	400	3

CONCLUSIONS

From the analysis of the real situation from the agricultural base, referring to the endowment with necessary technical systems for doing the agricultural procedures, the following conclusions can be seen:

1. the development and the diversification of the mechanization field for a total satisfaction of the requests of a modern agricultural economy, an improvement of all the activities of this system, is now an objective necessity, an up to date subject;
2. the mechanization is the main subject in the service providing from agriculture, of which depend in great part the quality and quantity level of agricultural production; referring to this domain and after seeing the results of the research we can show the following: the leadership of the agricultural base has aimed for the next years to buy first of all cereal cropping combine in order not to be forced to resort to other methods, as well as tractors of great power needed for procedures with a high energy consumption, but this tractors also need proper machines which to charge in a rational way the energy source; the organization of the mechanization activity in this agricultural exploitation must start first of all from the endowment of the mechanization sections with the necessary equipment for the number of procedures in the proper periods.
3. In order to reduce the financial effort needed for the endowment with new equipments, one must respect the following rules: changing the classical technology of cultures with modern technologies – with minimum changes of the soil, which reduce both the ordinary costs (fuel and labour force) but also the number of the needed equipments; the change of the culture's structure both by their number and also as cultivated areas, thus it can be avoid the top of the campaigns and uniform charges on every equipment.
4. In order to respect the time in the case of mechanized procedures, in the proper period from an agro technical point of view and to avoid overwork in top periods of the agricultural campaigns, the endowment with technical systems is again needed, both tractors and proper agricultural machines.

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Figures

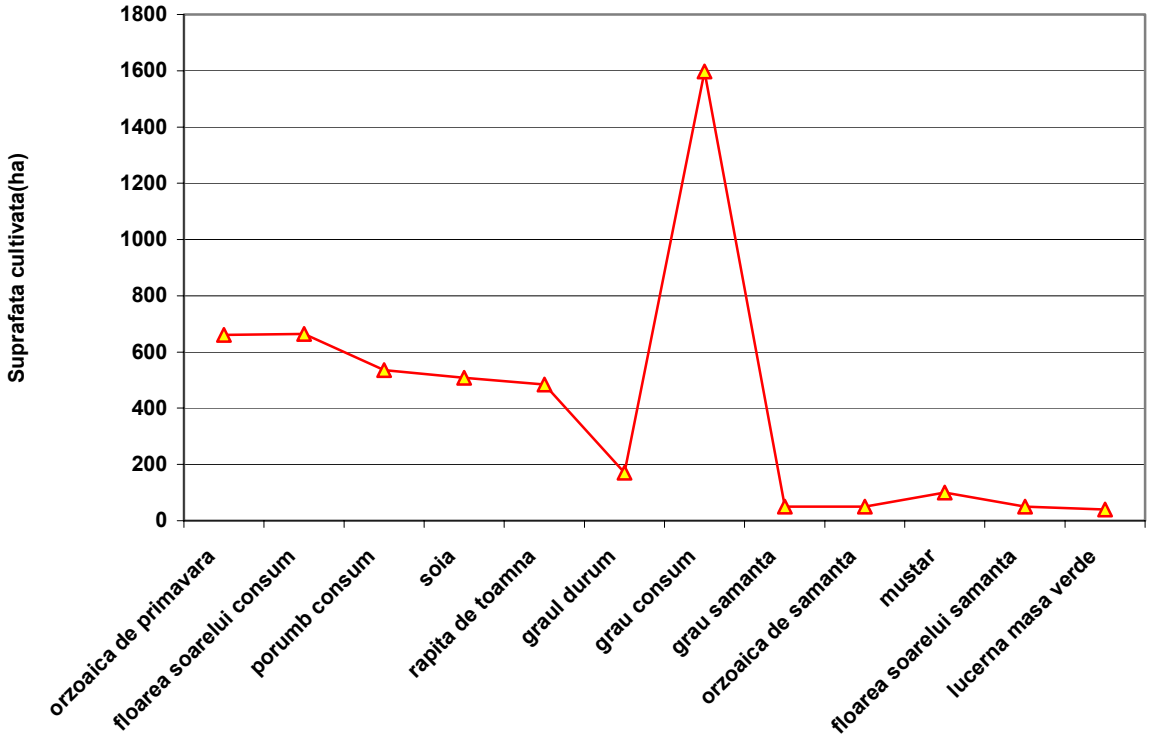

Fig. 1. The structure of the cultures in the period 2006-2007 (spring two row barley, sunflower, consumption corn, soya, autumn rape, durum wheat, consumption wheat, seed wheat, spring, two row barley, mustard, seed sunflower, lucerne green fodder)

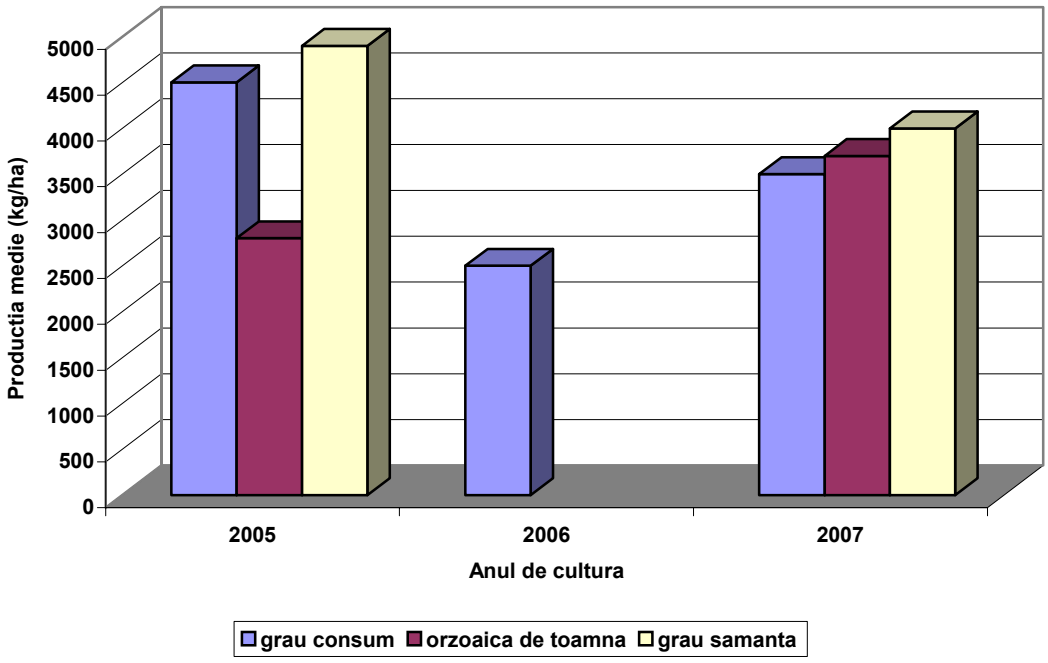

Fig. 2. The evolution of the production at the main autumn cultures in the period 2005-2007

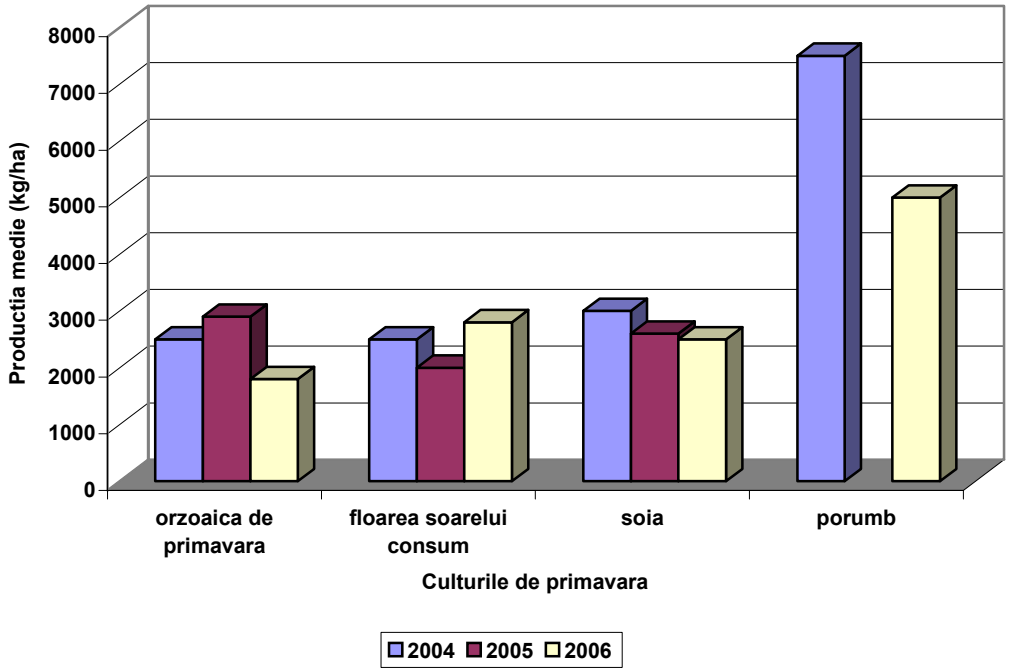

Fig. 3. The evolution of the production at the main spring cultures in the period 2004-2006 (spring two row barley, consumption sunflower, soya, corn)

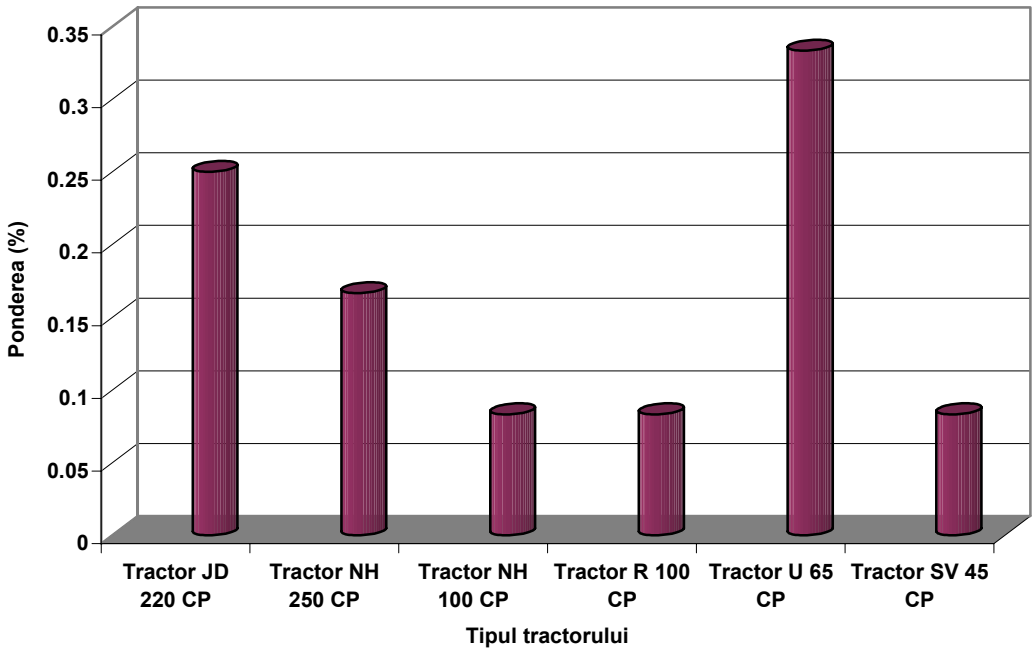

Fig. 4. The percentage of the tractor types in the agricultural base

Lucrări ştiinţifice U.S.A.M.V.B., Seria B, Vol. L, 2007

RESEARCHES REGARDING THE IMPROVEMENT OF CULTIVATION TECHNOLOGIES FOR THE MAIN AGRICULTURAL CONSUMPTION CULTURES AND SEED PRODUCTION

FARCAŞ N., SIMION C.O., POPESCU O., DOBRE P., IACOMI C., UDROIU Alina, SIMION Mariana

Key words: agriculture, cultivation technologies, the proper period, improvement

SUMMARY

The present paper wants to approach a theme connected to application technologies to the main agricultural cultures, in an agricultural base specialized on large culture and to present a series of solutions for their perfecting. Thus, it is seen the way in which the technological links are respected, the making of a proper structure of cultures which would allow works of tilling of the ground in a mechanized way in the proper period from the agro technical point of view, crop rotation and cropping system. All these elements were established according to the base conditions, the cultivated area, endowment with technical systems and their efficiency, to the financial power of every base. All changes from the main technologies aim to obtaining the lowest price on a product and after capitalization the highest profit. It was taken into consideration in this study both the culture technologies for the consumption plants and those for the production of seeds and there were even taken into consideration comparative aspects.

INTRODUCTION

The development of the Romanian agricultural field, aims at overtaking the present structural problems (the weak endowment with machines and equipment, crumbling the agricultural area) and the growth of the competitiveness of Romanian products on the Internal Market.

The absorption of the community funds is a target of the post-adhering strategy, taking into consideration the important contribution that these funds will have when recovering the differences compared to the development level from UE state members. The access to these financial resources through the European cohesion policy is one of the main economical benefits.

In order to become a clear beneficiary of the community funds, Romania must assure a higher degree of absorption of them. The funds that Romania will receive from UE are potential, while the contribution to the community budget is certain and represents a taken obligation as a state member.

Complementary to the community funds, the budgetary resources of the state and those that will be taken from the private system will be hired on the priority development directions:

For the period 2007-2013, Romania has as main objectives:

- the development of an agricultural competitive field, based on knowledge and private initiative;
- the reduction of the population involved in agriculture, together with creating economical viable exploitations, through efforts of reducing the higher degree of fragmentation of the agricultural area and of the number of small farms;
- maintaining the quality and the diversity of the rural and forest area in order to obtain a balance between the human activities and the conservation of natural resources.

MATERIAL AND METHOD

During the experiment, the cultivation technologies of plants for consumption were observed (autumn wheat, corn, sunflower) and those for seed production. Both classic and alternative (with minimum changes of the soil and direct seeding in the stubble field) technologies were used, with the aim that by their selection, quality tilling to be realized and also very important to obtain minimum expenses per a specific area in similar productive level conditions.

It was also made a comparative study between the productions obtained at the same culture, for consumption and for seed, as well as the obtained incomes for the whole production and also per a specific area.

RESULTS AND DISCUSSIONS

Taking into consideration those presented and following some clear rules regarding the application of plant cultivation technologies, one could obtain high quality products. Before going to the chemical methods regarding the fight against diseases, pest and weeds, first one must exhaust the organization methods regarding the placement of the culture, crop rotation, respecting the cropping system. The fertilization level of an agricultural field is important to be moderately realized and only according to a proper agrochemical classification. Each farmer has at hand these methods and can act as such.

Thus, a clear example is represented by the specific area where the researches have developed, meaning S.C. Transliberta, Călăraşi. The specific area S.C. Transliberta is specialized on large crops and seed trees in the case of the following main cultures: wheat, autumn and spring two row barley, sunflower, corn, soya, rape, mustard and so on.

The specific agricultural area started the activity in 2004 (in spring) taking on lease and grant land with a total of approximately 5000 ha in the year 2007. From the whole surface, only 1500 ha are arranged for irrigation, and the surface will grow in the future continuously.

In the autumn of 2006 the following cultures (for field) were initiated, on an area of 2367 ha: autumn wheat for consumption , autumn wheat for seed, autumn wheat “durum”, autumn two row barley for seed, rape for consumption.

In the spring of 2007 the following cultures were initiated on an area of 2542 ha: corn for consumption, soya for consumption, sunflower for consumption, spring two row barley, seed mustard, sunflower for seed, lucerne (old).

Table 1

The structure of the cultures in the autumn of 2006

Nr. crt.	Autumn culture	Cultivated area (ha)	Estimated production (kg/ha)
1.	Autumn wheat consumption	1611	3500
2.	Autumn wheat seed	50	4000
3.	Autumn wheat durum	171	3500
4.	Autumn two row barley seed	50	3700-rec
5.	Autumn rape consumption	485	1700

Table 2

The structure of the cultures in the spring of 2007

Nr. crt.	Spring culture	Cultivated area (ha)	Estimated production (kg/ha)
1.	Consumption corn	536	7000
2.	Soya corn	509	2800
3.	Sun flower consumption	664	3000
4.	Spring two row barley	661	2800
5.	Mustard seed	82	1500
6.	Sun flower Seed	50	1600
7.	Lucerne	40	15t/scythe

It must be seen the fact that ever since the first year, plots were being made for the seed production, cultures that involve extra technological expenses and a lot of care in applying the technological links. This year corn seed was produced, sun flower, mustard and Lucerne, 50 ha each.

During 2004-2005 grain was cultivated on 100 ha and mustard on 50 ha. During 2005-2006 two row barley seed was produced on 100 ha, sun flower and mustard on 50 ha each and during 2006-2007 wheat seed was produced, two row barley, sun flower and mustard (50 ha each).

During 2006-2007 the cultivated area was of 4914 ha having the following structure of the cultures.

The expenses for making a hectare of seed production compared to the consumption variant, as well as the valuing differences are presented in the following table.

Table 3

The progress of the culture structure and of the production for seed cultures, during 2004-2007, at the agricultural base S.C.Transliberta, Călăraşi

Seed culture	The period							
	2004		2004-2005		2005-2006		2006-2007	
	Area (ha)	Production (kg/ha)	Area (ha)	Production (kg/ha)	Area (ha)	Production (kg/ha)	Area (ha)	Production (kg/ha)
Wheat	-	-	100	4900	-	-	50	4000
Spring two row barley	-	-	-	-	100	2000	50	3700
Sun flower	50	1600	-	-	50	1800	50	1600
Corn	50	6500	-	-	-	-	-	-
Mustard	50	1200	50	1400	50	1500	50	1400
Lucerne	50	600	-	-	-	-	-	-

Table 4

A comparative study between consumption cultures and those for seed, during 2006-2007, at S.C. Trasliberta, Călăraşi

Culture	Specifications					
	Expenses/ ha (lei/ha)		Medium production (kg/ha)		Capitalization price (lei/kg)	
	C*	S*	C*	S*	C*	S*
Wheat	600	750	3500	4450	0,5	1,5
Two row barley	550	600	2500	2850	0,5	1,2
Sun flower	1100	1400	2580	1660	0,7	2,5
Corn	1000	1300	5800	6500	0,6	2,5
Mustard	400	450	1200	1375	0,5	1,0
Lucerne	400	450	-	600	-	40,0

Annotation: C* – Consumption culture
S* – Seed culture

From table 4 one can see a series of important observations:

- the necessary expenses for making the cultures of producing seed are bigger than in the case of consumption cultures with approximately 20%;
- the medium production obtained was bigger at the cultures of producing seed, except the sunflower. The explanation is that in the case of producing seed the cultivated area is incomparably smaller than in the consumption cultures;
- the capitalization price of the final product for areas that produce seed is 2-4 times bigger than the consumption product (table 5)

Table 5

The financial results in the case of cultures of producing seed, at S.C. Transilberta, Călăraşi

Culture	**Production value (lei/ha)**	
	C*	**S***
Wheat	1750	6675
Two row barley	1250	3420
Sun flower	1800	4150
Corn	3480	6250
Mustard	600	1375

Annotation: C* – Consumption culture
S* – Seed culture

In the case of obtaining a higher production and bigger capitalization prices in the case of seed cultures compared to those for consumption, making some areas and producing seeds represents a very profitable activity.

We must mention that at the seed production any technology mistake and any delay in making the procedures may lead to compromising the culture.

CONCLUSIONS

1. A strict following of the plant cultivation link cultures together with placing in optimum periods of executing the procedures, the endowment with advanced technical systems and of great productive rate led to good production results and because of this, the making of a complex investments program in the infrastructure of the base.
2. In the case of wheat culture for consumption, the cultivated area is large, which shows the importance of this culture in Transliberta. It was proved that in similar climate conditions good results with productions of 3500-5000 kg/ha were obtained.
3. In the case of cultivating wheat after Soya it was put into practice a technology with minimum changes of the soil (excluding the tilling and the preparation of the germinal bed) which consisted in doing deep breaking up procedures in the soil with the scarifier (without overturning the furrow) and seeding directly in the stubble field. The estimated production is of 3500 kg/ha.
4. Plant cultivation technology with minimum changes of the soil allows the reduction of energetic consumption and water conservation in the soil, at the same production value. We must mention that a change in classic technology is necessary with the one with minimum changes of the soil.
5. In the case of corn cultures (536 ha) and sunflower (664 ha), culture technologies that are used are the classic ones, with similar procedures for both cultures. There are estimated cultures of approximately 7000 kg/ha and of 3000 kg/ha. In the case of corn, besides the

classic technology it was also used successfully the technology with minimum changes of the soil.

6. Obtaining positive results in the productive agricultural field is possible only with the endowment with advanced technical systems, the exact application of the recommended technologies, doing the agricultural procedures in the proper period (from the agro technical point of view), using a proper structure of the cultures and the adequate rotation.
7. Technologies of plant cultivation for seed production need a strict following of the imposed conditions by the certifier for obtaining a good result. These procedures refer to the placement of the cultures, respecting the isolation space, doing at the right time the specific procedures (seeding, biological purification, castration).
8. Used technologies producing seed involve extra expenses, but the total value of the production for every specific area after valuing the product, is superior to the one obtained in the case of consumption cultures.
9. When the agricultural base taken in study has confronted with extreme weather (flooding, severe drought), the economical results were positive both for the consumption cultures and those for seed production, all along the period when it functioned;
10. The agricultural base S.C. Trasliberta aimed for the near future to buy technical material for completing the tractors park and agricultural machines, to extend the cultivated area for irrigation and to extend the areas cultivated with plants for seed production.

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Figures

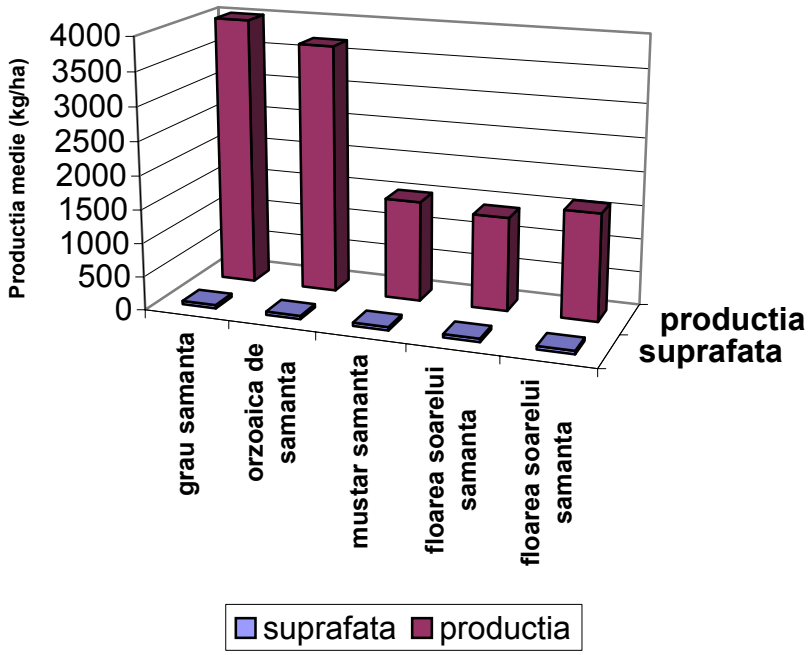

Fig.1. The structure of the seed culture and the production in the period 2004-2007 in C.S. Transliberta

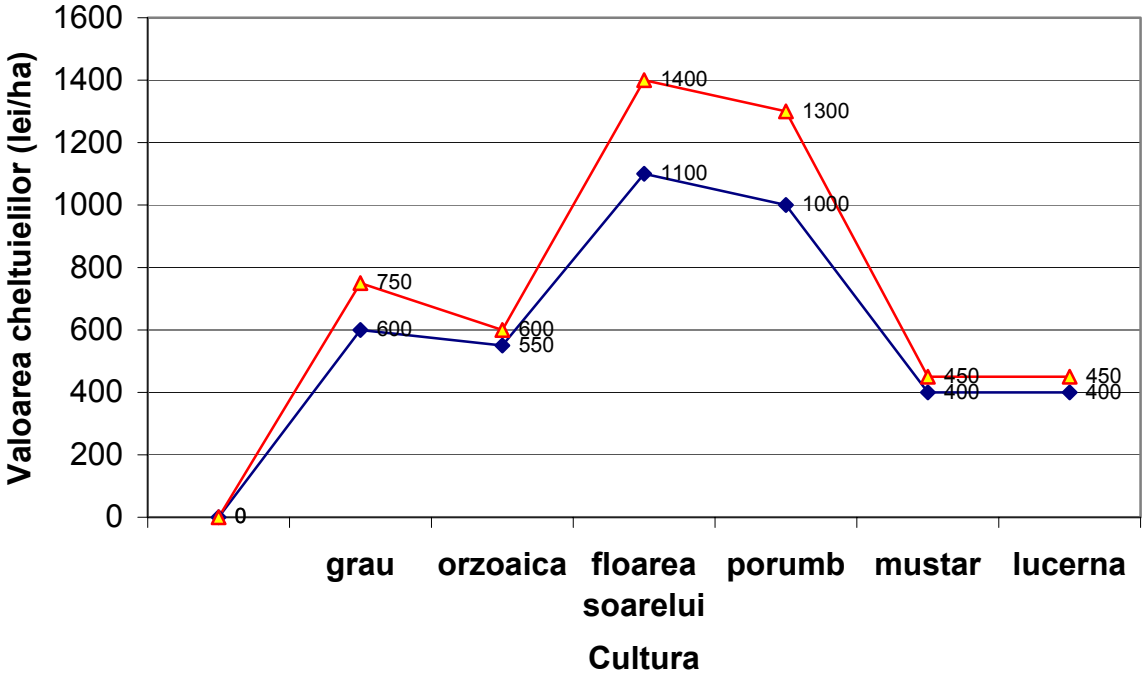

Fig.2. The value of the expenses for initiating a hectare for seed (red curve) or for consumption (blue curve)

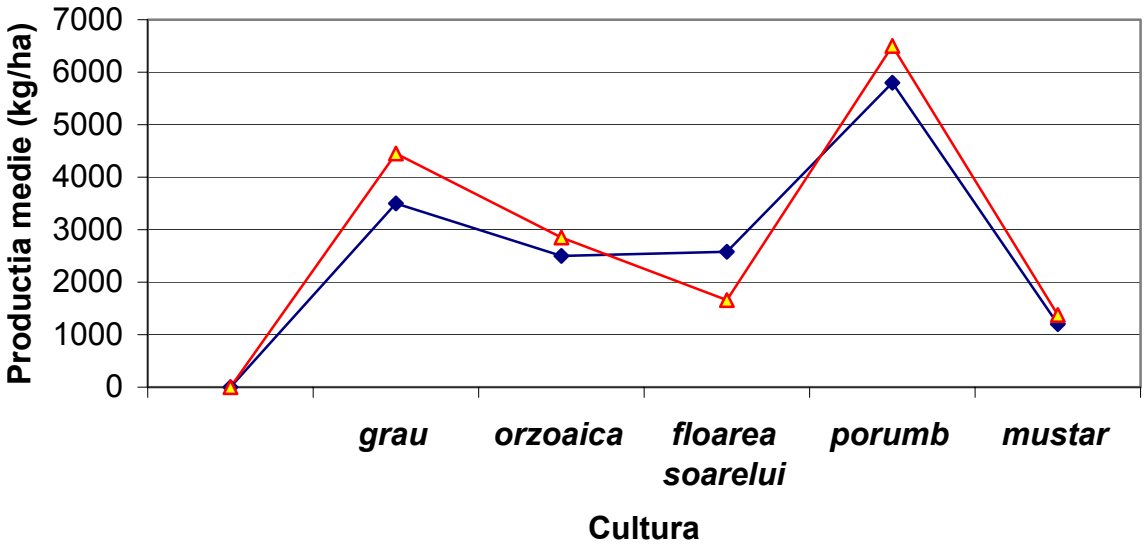

Fig.3. The medium production at the hectare for seed production (red curve) and the hectare for consumption (blue curve)

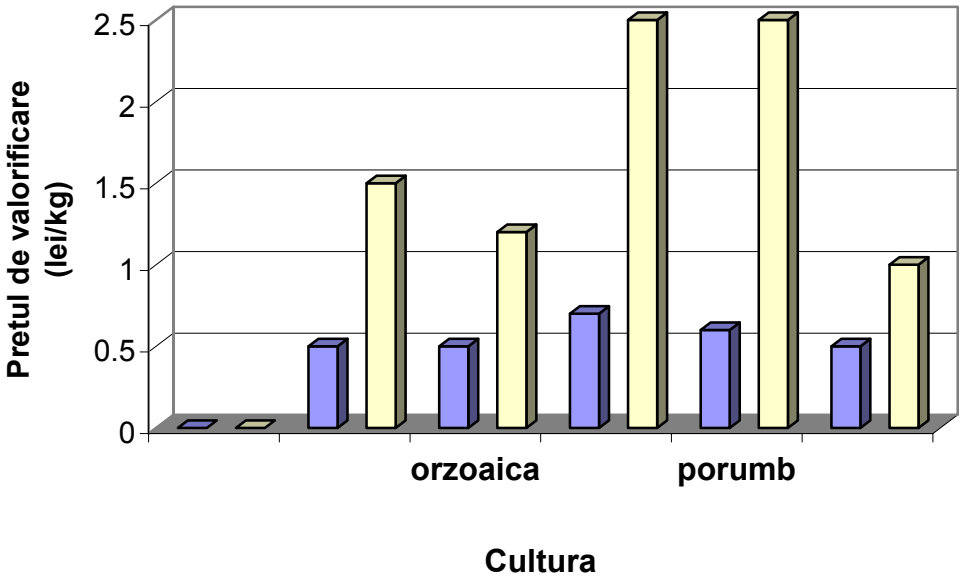

Fig. 4. The valuing price of the products (lei/kg) for seed (uellow) and consumption (blue)

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IMPLEMENTING AND DEVELOPMENT OF WAYS OF CREDIT – FINANCING IN ROMANIA'S AGRICULTURE

SIMION C.O., FARCAŞ N., SIMION Mariana, BUIANU Vergina

Key words: agriculture, credit, financing, unredeemable funds, private co financing

SUMMARY

Regarding the loan in agriculture, market economy means capital, capital market, securities market, commodities market, all developed and which have as purpose making great profit, but referring to the already mentioned elements of the market economy, one cannot exclude banks, loan, a speeding up of the capital turn and of the money in general.
Talking only about financing agriculture is not enough. Often commercial bankers show a very low preference of the financial institutions that they represent for agricultural involvement. There are three major aspects that deserve to be emphasized here: productivity, in general, low in our agriculture, which is itself an element of discourage; the disadvantage that the agricultural field has anywhere in the world compared to industry and services; important subventions from the competition countries. In counties with advanced economy, mechanisms that are supported by farmers function with public policy. It is true that it suffers changes, as it happens with Agricultural Common Policy in UE, which means subventions that decrease in future years.
The present paper is a synthetic presentation of loaning and financing in agriculture and also a case study regarding financing an eligible project from this field.

INTRODUCTION

Romania's adhering to the European Union was possible because of the existence of a viable market economy which could face competition on the community market and to develop the capacity of assimilation and implementation of the adopted legislation by the EU (the community's acquis). The special pre adhering program, the implementation of the SAPARD Program with all its investment programs in agriculture, development, modernization and diversification of the agricultural activities was and still is the main method of positive transformation of Romanian agriculture, towards a European agriculture.

As it is well known, Romania ended in the summer of 2004 one of the most difficult chapters of negotiation, chapter 7 Agriculture, at the Conference of new states adhering which took place in Bruxelles. It still continues the implementation of the legislation harmonized with the community's acquis at local level. This is permanently observed with the help of the implementation plan at local level of the legislation harmonized with community acquis, activity made at DADR level which by their rules and actions is in full process of implementing European legislation.

Romania's agriculture adhering in the economical system of the EU, at the same time with Romania's adhering in EU was possible by respecting some rules and reaching certain objectives as priorities in the development of this field of activity.

MATERIAL AND METHOD

The main financing program for agriculture, for its modernization and adhering in European structures is the SAPARD program. This program offers unredeemable funds for eligible programs, up to 50 % from the entire value, the difference being covered by private co financing. After the adhering of our country in EU a structure belonging to the Agriculture Ministry – which represents an authority which can approve contracts for projects in agriculture was initiated, like the Paying Agency for Rural and Fishing development. A study

was made in which there are presented the aims of the financing programs from agriculture as well as a case study of an eligible project which takes into consideration the endowment with technical equipment.

RESULTS AND DISCUSSIONS

In the present paper a study was made regarding the main aims, as development priorities for Romanian agriculture and achievement techniques.

Table 1

Main objectives in Romanian agricultural develop

	Main objectives	**Ways of achievement**
1.	The stimulation of rural farms transformation in agricultural viable farms	- the rising of the number of agricultural exploitations in associated system, their collaboration with professional associations on each product in order to lead correctly the strategies and agricultural policies.
2.	The efficient allocation of budgetary resources for supporting agricultural producers	- subsidization of the selected seeds, all seeding material and seminal material genetically improved; - The encouragement of the production of cultures with deficits: technical crops, sugar beet, bio- ecological cultures; - Subsidization of the insurance and paying the compensations for natural calamities; - giving the subvention for electric energy for irrigations and every day procedures.
3.	The valuation of the agricultural potential with measures of production and quality growth.	- optimization of the structures of cultures at the same time with reconsidering the role of crop rotation and cropping system; - the systematic achievement of improvement procedures and fertilization of the soils with the help of chemical and organic manure in a balance manner which to take place annual. - the chemical fight against the weeds, with mechanical and manual hoeing, of the pest and diseased, together with agro phytotechnical rules; - using the production technologies of the seeds with a high biological value.
4.	Supporting the agricultural production valuation with market techniques	- advising the producers for making producers groups and their observation for having access to external financing;
5.	Implementing the international financial programs	- insuring technical assistance; - Checking the eligibility of the financing requests and of the paying requests for all taken projects;
6.	Implementing at a local level of the legislation in harmony with the community acquis	- stimulating the growth of the number of agricultural commercial exploitations by association, lease, granting the fields as well as transforming the rural farms in family commercial farms and thus, the middle class appears in the rural space; - the registration of the producers, of the collective deposits, dispatch centers and of the plants importers, vegetal products or statutory articles.

Next we present a study case regarding the making and financing of an eligible project, for agriculture in the Sapard program. The pattern of the contract is signed by Payment Agency for Rural Development and Fishing and a Physical Authorized Person.

The purpose of the contract is giving unredeemable financing by the authority that was solicited, to put into practice the project: "Modernizing the vegetal farm" which belongs to the physical authorized person.

The time necessary for accomplishing the program, according to the making plan of the investment from the fez ability study was of three months. The validity duration of the contract includes the execution period of the project to which five years are added since the day of the last payment made by the Authority that was solicited.

The total eligible value of the project which is the purpose of the unredeemable financing by the Authority that was solicited is estimated at 675.365 RON of which maximum 337.682 RON belongs to the authority.

The payment is made taking into consideration the payment requests authorized by the Payment Agency that the beneficiary must have together with justifying papers. In table 2 a series of aspects regarding the indicative budget of the project are presented.

Table 2

The indicative budget of the project

The name of the expenses chapters	**Eligible expenses (Ron)**	**Ineligible expenses (Ron)**	**Total (Ron)**
1. Expenses for project making and technical assistance – total of which: 1.1. Obtaining advices, agreements and authorizations, projecting, the checking of the project, advisory service, technical assistance and building site supervisor. 1.2. The planning of the auction.	19.671 19.671 0	609 609 0	20.280 20.208 0
2. Expenses for the main investment	655.694	0	655.694
3. Expenses with independent acquisitions – total of which: 3.1. Machines, equipments, installations and agricultural equipments;	655.694 655.694	0 0	655.694 655.694
4. Other expenses – total of which: 4.1 Commissions, taxes, legal quotations, financing costs	0 0	2.817 2.817	2.817 2.817
Total (general)	675.365	3.426	678.791
VAT value	0	128.435	128.435
Total + VTA	807.226		
Financial plan			
I. Public unredeemable help	337.682	0	337.682
II. Private co financing, of which: - auto financing - loans	337.682 337.682	131.861 0 131.861	469.544 0 469.544
TOTAL PROJECT (I+II)	675.365	131.861	807.226

Table 3

Technical systems acquisitions

	Agricultural equipments	**Quantity (piece)**	**The price of the equipment (Euro)**
1.	Deutz-Faehr Tractor, Agrotron 200 type, 3013 series.	1	80.000
2.	Same Tractor, Explorel 95 DT type	1	26.500
3.	Sigma frontal charger, Iron 30 type, equipped with standard bucket, ballots pitchfork, and bucket with bars.	1	11.300
4.	Machines for packing ballots Supertino type, ABS 15 S type with electro hydraulic drive.	1	9480
TOTAL			127.280

CONCLUSIONS

Analyzing the obtained results, after the study, there are a series of conclusions, as follows:

1. The absorption of community funds is an objective of its own of the post adhering strategy, taking into consideration the importance of the contribution that this funds will have at recovering the delays compared to the development level of EU states. The access to this financial resource with the help of European cohesion policy is one of the main economic advantages.
2. In order to become a real beneficiary of the community funds, Romania must preserve a higher degree of absorption of these. The funds that Romania will receive from EU are potential, but the contribution to the community budget is certain it is also a taken obligation as a state member.
3. real information of all potential categories of solicitants and beneficiaries of the projects financed by Europeans funds. Information campaigns must give detailed information about the created possibilities, the way they are applied and to use for this the most appropriate ways of communication;
4. making sure with priority of the administrative capacity of all the institutions involved in managing and implementing community funds for them to do their activity in high, efficient and transparent standards. A special importance must be put on training a proper number of specialists in managing the community funds, which to handle the entire spectrum of Romanian public administration both geographically and thematically.
5. The support for the project promoters for establishing a portfolio of mature projects, which could be financed immediately after getting the authorization of the operational programs. A permanent renewing of this project reserve is a guarantee of the growth of absorption of the community funds.
6. Using the funds according to strategic directions of development approved in the special papers for the period 2007-2013. In these papers negotiated with European Commission, Romania's government has the possibility of choosing in a priority way those projects of financing that address to the mentioned fields of the social- economic way of development (physical infrastructure and human capital);
7. Managing the funds at a level as close to the local and regional needs, according to the local specific and local priorities; the state's involvement only there where the optimum management of the funds overtakes the capacity of local public administration. Moreover, it is very important, drawing financial resources complementary to community funds by developing public-private partnerships in priority development domains, according to local specific.

8. Managing and implementing community funds must be made with the involvement of all society components, from national, regional, local public authorities to economic and social partners, civil society and so on;
9. Contributions from Structural Instruments do not replace structural public expenses or synonyms of a member state.

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THE MODERNIZATION OF AGRICULTURAL EXPLOITATIONS IN ROMANIA ACCORDING TO EC RULE 1698/2005

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Keywords: agriculture, agricultural exploitations, modernization, efficiency, productivity, finance

SUMMARY

Romania's European integration brings for agriculture a series of advantages expressed in real life by the growth of agriculture's production, the encouragement of the development of middle (not more than 50 hectares) and high (more than 100 ha) agricultural exploitations, the improvement of the access of the agricultural products on UE market and the disappearance of all commercial barriers, as well as the slowing down of the migration of the manpower from agriculture. The private agriculture is characterized in present by a excessive splitting of the infield and also of the system of agricole production, with negative impact over the product's market. The support for the foundation of producers groups will contribute to the growth of the economical efficiency of agricultural exploitations, having an important role in the improvement of the quality of the products, of environment protection, of web provision and marketplace as well as in establishing a balance between consumption and offer.

INTRODUCTION

The structural changes that took place in the Romanian agriculture, having as effect the process of changing to private property of over 96% of the infields have determined small and moderate exploitations. The main form of agricultural exploitation is represented by the small rural farm, with an entire surface of 1.8 hectares of infield and a percentage of 53% of the entire infield of the country.

Agricultural exploitations, especially those from the vegetal field, are dealing with an insufficient endowment as well as with the existence of a high degree of physical and moral dilapidation of the already existing materials. Thus, the medium charge on a physical tractor is of 58.6 ha infield (arable soil) and the medium charge on a cropper is of 80-90 ha infield. From the land under crop, a high share has the cereals with over 60% and the technical plants over 16.3%. Vine crops, with noble breed in bearing have diminished at 16.3% and the surfaces of orchards and nursery gardens have diminished at 13.7% as a consequence of the land clearing of the land under crop.

The zootehnic exploitations were noticed for their household or semi intensive system of animal breeding, with a small population of animals, with low genetically performances, which do not assure both hygiene and well fare conditions of animals and using certain technologies of animal breeding that would respect the environment conditions. The animal population have continuously diminished, thus: with 7.8% in the case of bovine, with 28.5% in the case of swine and 11.4% in the case of ovine.

The purpose of the given support by rule is the modernization of agricultural exploitations in order to introduce, in the transition period of the minimum approved standards of environment, hygiene and the wall fare of animals, the improvement of the economical performance by a better using of the production element, including the introduction of new technologies and innovations, that are interested in quality and diversity of the agriculture production.

The characteristic objectives for the modernisation of agriculture refer to the modernization of the specific technologies, the reduction of production costs, the reduction of

production loses, the growth of efficiency, a better using of manpower in agriculture, the value of agriculture potential of every area and encouraging the rivals.

MATERIAL AND METHOD

This study takes into consideration the establishment of the viability of some measures that stood at the base of the modernization of the agricultural exploitations, and one of them refers at the Sapard Programme as well as the measures that are imposed to be taken in the immediate period of the integration.

With the help of the Sapard Programme, in the programme "Investments in the agricultural exploitations" in 2003-2006 a support for 612 projects of modernization of vegetal and zootechnic farms was given. In the study, article 26 from the Rule (EC) nr.1698/2005 is mentioned.

The support given to this programme is complementary to the actions mentioned in other programmes from Axe I: "The growth of the added value of agricultural products", "The support of founding producers groups", "The improvement and the development of infrastructure important for the development and the adaptation of agriculture and forestry", "the installation of the new people responsible for agriculture", " The early retirement of the people responsible with the agriculture and the workers", "The professional forming and actins of information, including spreading new specific knowledge also in practice, innovative for farmers" with rules from Axe II: "Support given to the people responsible with agriculture in areas with problems:, "Support for the welfare of the animals", "Agro-ecological support", with rules from Axe III: "Base services for economy and rural population", as well as with measures that regard the implementation of local development strategies from Axe IV.

RESULTS AND DISCUSSIONS

The content of the mentioned rule for the modernization of the agricultural exploitations is about a series of aspects that would allow the improvement of the general performances of the agricultural exploitations, respecting the standards of the Community-applicable to the respective investments. These aspects refer to:

- the acquisition of the necessary equipment for the modernization of the exploitations of the vegetal by endowment with tractors, croppers, machines, installations and agricole equipments, including for calibration, selecting, conditioning and storing of the resulted agricole products obtained and used by the farm, irrigation systems, special equipment for dealing with the vegetable remains.
- buildings new and/or modernization of the buildings (offices, places to store and select, warehouse of fuel, detop for the equipment, the surroundings and so on) and utilities (water feeding, electrical energy, thermic energy, throwing the waste, sewerage and so on) in vegetal farms.
- building and/or the modernization of the greenhouses, including the necessary thermic equipment and irrigation system, assuring the utilities in order to respect the conditions to protect the environment.
- costs representing the architect's, engineer's, consultant's salary, the legal taxes of feasibility studies, the endowment of licences, for preparing and/or implementing the project, directly associated by the rule that does not pass 12% of the total eligible cost of the project.
- the endowment of new, specialised ways of transport – necessary as a result of their identification in the feasibility study;

- costs regarding the endowment of land for specific buildings, including the main building, when the agricultural exploitations are moved in a different place, but not more than 10 % from the value of the project;
- soft - materials for the use of the computer, including the costs of installation and assembling.
- the acquisition of animals (reproductive- male) with high genetic potential, mentioning the origin (pedigree), as well as the acquisition of seminal material of good quality;
- the endowment with tractors, equipment, machines, installations and equipments for the activities from the animal farms ;
- investments that promote the production of biogas from the manure, obtained from their own farms or collected from other farms.
- new buildings and/or the modernization of the buildings from the farms where there are animals and birds, adding other buildings or utilities: paddocks, the place where the hay is kept, the sewerage system, platforms for evacuation, purifying systems, special equipments for producing and measuring complex fodders, rooms for milking and collecting the milk, thermic installation, warehouses for fuel, water feeding installation, sewerage, electrical installations, surroundings (fence in), and so on.

Are not eligible expenses: fertilizing the soil for the trees, vine, investments in irrigating equipment for vine crops, acquisitions of female animals according to Article 48, point 2 from the Statutes of applying the Statutes of the Council (CE) NR.1698/2005, annual (perennial) plants acquisitions according to Article 48, point 2 from the Statutes of applying the Statutes of the Council (EC) nr. 1698/2005.

Table 1

Measures that must be taken in post-adhering period

Priorities on short term	Priorities on long and medium term
➢ The intensification of the process of implementing the aquis, especially to the sanitary plants and veterinary; ➢ The finalization of the institutional building necessary for the functioning of the Agricultural Policy, according to EU rules; ➢ The growth of the foreign investment capital and the valuing of the already existing advantages: good infields, cheap and relatively qualified manpower, possibilities for organic agriculture; ➢ The adhering in the common market arrangements of a series of agriculture products, including the land under crop, sugar, animal products and the specialized crops; ➢ The flourishing of the opportunities given by the common aquis in agriculture. A segment which relates to the specific character of the Romanian agriculture is the ecological agriculture; ➢ The continuous information of the population involved in agriculture, as well as the rural population in general, regarding the costs and the benefits of PAC, to the common rules or to other financial facilities.	➢ Reorganising and modernizing the agro alimentary field and the forest field in order to face the demands of the internal market; ➢ The encouragement of the consolidation process through a landed functional market, supporting the transformation of the farms of semi-sub existence in viable (commercially) exploitations and supporting the forming of associations between farmers with the purpose of valuing the products; ➢ The improvement of the quality of the procedures, the control and the quality of the alimentary products by respecting the minimum safety rules of aliments imposed by PAC requests; ➢ Promoting the direct investments capital which regard introducing new technologies and improvement of the product's quality; ➢ Making and implementing operational plans for assuring the market's transparency both for creating information systems regarding the price of the agricultural products and regarding the price of the land.

The support given by this rule has a volume and a value of the subsidy concretized by:

- Public help (national and of the community) given in this rule will not be more than 50% from the entire eligible expenses.

- Public help (national and of the community) given in this rule will not be more than 60% from the entire eligible expenses for the young who work in agriculture from the mentioned areas in art.36 (a), points (i)- areas protected Nature 2000.
- The Community's support will be available from the1st of January 2007 (on condition that the Community's legislation will be active).
- The transition period for reaching the Community's standards is of 3 years from the day of the adhering.

The development of the agricultural field in Romania takes into involves the overcoming of present structural problems (the weak endowment with cars and equipment, the crumbling of the agricultural soil) and the growth of the competitiveness of the Romanian products on the internal market. For the period 2007-2013, Romania has as main objectives:

- the development of a competitive part of agriculture and forestry (a certain domain), based on knowledge and private initiative;
- the reduction of the dimension of the population from agriculture, related to the creation of economical exploitations, by the effort of making reductions of the high degree of fragmentation of the soil (the agriculture soil) and the number of the small farms.
- The maintaining of the quality and of the diversity of the rural and forest space, for obtaining a balance between the human activities and the conservation of the natural resources.

In order to reach these objectives, the priorities in agriculture in the post-adhering are structured as follows: (table 1)

CONCLUSIONS

1. In conclusion, we can say that the development of the private agriculture especially the improvement of economical efficiency of agriculture exploitations in Romania , is the main element that makes us different from the evolved agriculture of the EU counties.
2. Thus, so that Romania can be successful in agriculture, including with the help of the implementation of the programme ruled until 2006 – Sapard, (the country) must have numerous programs post adhering which could lead to an efficient agriculture, based on equal chances in competition with the countries which already have an evolved agriculture.
3. The continuity of implementing programs in agriculture and the rural development must become a priority for Romania, in order to reduce the already existent difference between countries with high potential and our country.

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THE PROTECTION OF WHEAT CROPS AGAINST ANNUAL AND PERENNIAL MONO AND DICOYLEDONOUS WEEDS THE CRIŞURILOR PLAIN CONDITIONS

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Keywords: area, monocotyledonous, dicotyledonous, rotation, herbicides

SUMMARY

In the preluvosoil area the winter - wheat it's infesting in different level in every year. The weight and number of weeds is in correlation with rotation applicated and background used. In the stationary experience with crop rotation, in the wheat monoculture and in rotation of two years the floristically structure predominant are annual monocotyledonous weeds (Apera) with weight between 66–79%, and in the rotation of three and four years predominant are dicotyledonous weeds (74-80%). The practicing of this rotations contribute to the decreasing of wheat infestation with 35-45%, in the rotation of two years, with 90- 91%, in the rotation of four years, and with infestation Apera spica venti from 47- 51%, to 98%. Using of specific herbicides in the control of weeds is necessary every year in the monoculture and in the rotation of two or three years and once to two and three years in the rotation of four years.

INTRODUCTION

The successive of crops and typical technologies of every crop as part of a crop rotation it influenced the different level of infestation. The participation of wheat crop as part of the crop rotation had a strong influence on weeds development.

The applications of fertilizers especially that with nitrogen contribute to a strong differentiate level of weed infestation, of floristically structure and of resistance of crop in struggle with weeds.

In this paper is presented the infestation of wheat crop with in different crop rotation and chemical control of annual and perennial mono and icotyledonous weeds.

MATERIAL AND METHOD

The researches carried out in the stationary long term experience at SCDA Oradea on a preluvosoil with humus content by content 2,32% , clay content by 32,5% and pH 5,5, was studied the infestation with weeds of wheat and floristical structure in comparison with wheat in monoculture the influence of three type of crop rotation: wheat- maize; pea- wheat- maize; pea- wheat- maize- maize and three level of fertilization: N0P0, N120P80, N100P80, manure (in different rates: 10 t/ha applicated annual at wheat, 20 t/ha applicated at two years on maize in the rotation of two years, 30t/ha at ,maize in rotation of four years). The establishing of level of infestation and the floristically structure was made at the end of spring, in the earlier stage of development and before harvesting, by numbering and gravimetrical methods (was estimated the dominated weeds with a weight 60 .

The efficacy and selectivity of herbicides was determined by EWRS scale.

Work over and results interpretation was made through variation analysis method.

RESULTS AND DISCUSSION

The long influence of crop rotation and fertilizer on floristically composition of wheat infestation**.**

In the monoculture of wheat had a specific infestation with dicotyledonous weds like: Matricaria, Raphanus, Chenopodium, Polygonumm Cirsium, Stellaria and monocotyledonous wheat like Apera.

Along the analyzed period (2004-2006) a higher level of infestation is registered in wheat monoculture with a total number of weeds by 253 m² at un fertilized wheat, 286 weeds-m² on the N120P80 background, respectively 313 weds/m² on organo-mineral background, with weight of Apera specie between 77- 79%. The dominated dicotyledonous weeds are: Matricaria, Raphanus, Chenopodium, Polygonum, Cirsium, Stellaria.(tebel 1)

In the rotation of two years wheat-maize total number of weeds is decreasing in comparison with monoculture by 1,6 times and was registered the lowest value in the unfertilized variant 140 weds/m^2, and bigger one by 188 weeds/m^2 on the organo-mineral background with $N_{100}P_{80}$ + 20t/ha manure. The weight of Apera species was 66-70 %, depending on background used, respectively 9-11%.

The rotation of 3 years, pea – wheat – maize determinate a modification of ratio between species, because the dominated weeds are the dicotyledonous weeds with a weight by 75-83 % and the monocotyledonous weeds are reduced in comparison with monoculture crop with value of 17-25 %. The decreasing of total number of weeds in comparison with monoculture is 4,1 times and it is increasing the weight of weeds like: Matricaria (21-22 %), Raphanus (16-17%), Polygonum (16-17%).

In crop rotation of 4 years, pea-wheat – maize – maize, the infestation of wheat with weeds is reduced because of dicotyledonous weeds and annual monocotyledonous weeds, the total number of weds were between 10/m^2 in unfertilized variant and 27/m^2 in variant with organo-mineral fertilization. The role of crop rotation is distinguished in the decreasing weight of Apera species which had outrunning 20%. The dominated dicotyledonous weeds are: Matricaria, Raphanus, Polygonum, Chenopodium.

The influence of crop rotation and fertilizers on number of weeds.

The analysis of weeds infestation establishing an increasing from the unfertilizered variant (253 /m²) to variant with organo-mineral fertilization (313/m²). In the rotation of two years is reducing number of weeds with 35 – 40%. The number of Apera spica venti in comparison with monoculture is reducing with 47 – 51%.(table 2)

The rotations of three and four years had the most important role in decreasing of total infestation the three background with values between 74 – 77%, respectively 90 – 96%

The influence of crop rotation of fertilizers and herbicides on weeds control and wheat yield.

In the case of preluvosoil from north – western part of the country, at once with the increasing of wheat weight in crop rotation, with monoculture practicing and of cereals agriculture, with short rotations, was selected in the wheat crop species weeds, dominated especially by annual monocotyledonous weeds, in the case, Apera spica venti.

To contribute at decreasing of negative effect of monoculture and of rotation of two or three years regarding to wheat infestation is necessary the utilization of specific herbicides (for Apera spica venti control) in the same time with the control of annual and perennial dicotyledonous weeds.

Was used the following herbicides: Puma Super (fenoxapropil – etil 75 g/l), Assert (Imazabetabenz 250 g/l) and Attribut 70 WG, (Propoxicarbazan 70%) in association with Glean 75 DF (Clorsulfuron 750 g/kg), Rival Super Star (37,5% triberuron + 37,5% Clorsulfuron), Oltisan M (100 g/l 2,4 D ester).

The herbicides, the rates and the application time are presented in table 3. The herbicides applicated was selective for the wheat from Dropia variety (EWRS note – 1,0). The result obtained regarding to the control of annual and perennial dicotyledonous weeds and annual monocotyledonous weeds (Apera) realizing that applicated treatments had a efficacy over 90%. The best degree of control was realized using herbicides like Puma Super + Glean (96 – 98%) followed by Assert + Rival Super Star (95 – 96%) respective by Attribute + Oltisan M.

Regarding of obtained yield, in the wheat monoculture, the herbicides brings on yield gain by 15 – 17%, in the rotation of two years 12 – 13%, and in crop rotation of three years and four years de yield gains are of 9 – 10% and 4 -5% respectively due positive effect of the crop rotation on weeding.

CONCLUSIONS

The weight and number of weeds from wheat crop is in correlation with the rotation practiced and background used

In the monoculture and in the rotation of two years on three background used, the weight in the floristically structure is taken by Apera species (66 – 79%) and in the rotation of three and four years by dicotyledonous weeds (74 – 80%)

The total number of weeds is decreasing in the rotation of two years a comparison with monoculture, with values between 35 - 45%, in the rotation of three years with value between 74 – 77% and in the rotation of four years with values between 90 – 91%

The decreasing of herbicides for the control of monocotyledonous weeds (Puma S. Attribut, Assent), in association with anti dicotyledonous, is necessary in every years in the wheat monoculture and brings yield gain by 14 – 17%, in the rotation of two years da in by 12 – 13% and in the rotation of three years by 8 – 20%. In the rotation of three years is necessary the application of herbicides once to 3 – 4 years in correlation with climatic conditions favourable for infestation.

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Table 1

Floristically structure of weeds (%) from wheat crop cultivated in different rotations, Oradea 2004 – 2006

Weeds	Wheat monocrop			Wheat - maize			Pea – wheat - maize			Pea – wheat – maize		
	N_0P_0	$N_{100}P_{80}$	$N_{100}P_{80}$ + 10t/ha*	N_0P_0	$N_{100}P_{80}$	$N_{100}P_{80}$ + 20t/ha*	N_0P_0	$N_{100}P_{80}$	$N_{100}P_{80}$ + 30t/ha*	N_0P_0	$N_{100}P_{80}$	$N_{100}P_{80}$ + 40t/ha*
Apera	79	74	79	70	66	68	25	19	21	20	18	19
Matricaria	7	8	7	11	9	11	22	21	22	30	21	21
Raphanus	4	5	4	6	6	6	17	16	17	20	18	15
Chenopodium	3	3	2	3	3	5	12	12	8	10	11	11
Polygonum	4	6	5	6	6	7	17	17	17	20	18	19
Cirsium	2	3	2	4	4	3	5	11	10	9	13	11
Other species	1	1	1	0	2	0	2	4	5	1	1	4

Table 2

Influence of the crop rotation and fertilization on number of weeds in wheat from preluvosoil, Oradea 2004 – 2006

Crop rotation	Background	Number of weeds/m			% decreasing vs. monocrop		
		Total	APESP	DA + DP	Total	APESP	DA + DP
Wheat monocrop	N_0P_0	253	199	54	100	100	100
	$N_{120}P_{80}$	286	211	75	100	100	100
	$N_{100}P_{80}$ + 10t/ha*	313	243	70	100	100	100
Wheat - maize	N_0P_0	140	98	42	45	51	22
	$N_{120}P_{80}$	185	125	60	35	49	20
	$N_{100}P_{80}$ + 20t/ha*	188	129	59	40	47	16
Pea – wheat – maize	N_0P_0	58	14	44	77	93	19
	$N_{120}P_{80}$	75	14	61	74	93	19
	$N_{100}P_{80}$ + 30t/ha*	77	16	61	75	93	13
Pea – wheat – maize - maize	N_0P_0	10	3	7	96	98	87
	$N_{120}P_{80}$	28	5	23	90	98	69
	$N_{100}P_{80}$ + 40t/ha*	27	5	22	91	98	69

Table 3

Influence of the herbicides use on yield wheat from different crop rotation in the condition of preluvosoil, Oradea 2004 – 2006

Crop rotation	Herbicides	Rate/ha	Period of application	Yield		Efficacy %
				Kg/ha	%	
Wheat monocrop	Puma super + Glean	0,8 + 20 g	Preem	3020	117	98
	Assert + Rival super star	2,0 + 20 g	Preem	2980	115	96
	Attribut + Oltisan M	0.100 + 1,0	Preem	2970	115	05
	Untreated	-	-	2590	100	0
Wheat – maize	Puma super + Glean	0,8 + 20 g	Preem	3860	112	98
	Assert + Rival super star	2,0 + 20 g	Preem	3900	113	96
	Attribut + Oltisan M	0.100 + 1,0	Preem	3850	112	95
	Untreated	-	-	3440	100	0
Pea – wheat – maize	Puma super + Glean	0,8 + 20 g	Preem	4400	110	98
	Assert + Rival super star	2,0 + 20 g	Preem	4380	109	96
	Attribut + Oltisan M	0.100 + 1,0	Preem	4400	110	95
	Untreated	-	-	4010	100	0
Pea – wheat – maize – maize	Puma super + Glean	0,8 + 20 g	Preem	4140	105	98
	Assert + Rival super star	2,0 + 20 g	Preem	4130	105	96
	Attribut + Oltisan M	0.100 + 1,0	Preem	4090	104	95
	Untreated	-	-	3930	100	0

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THE BEHAVIOUR OF SOME SPECIES OF APRICOT TREES IN THE CLIMATIC CONDITIONS CHARACTERIZING ORADEA REGION IN 2005

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Keywords: apricot, fruit, species, climatic factors

SUMMARY

The experiment takes 22 species of apricot trees having different periods of ripening of the fruit. The ripening of the fruit is placed at intervals beginning with the first decade of June and going on until the last decade of July. The richest fruit crops were registered at the species: Comandor, Mamaia, Favotit, Sirena.

INTRODUCTION

The apricot tree is a species of a great value for the regions where it can be grown, being a pretentious species towards the high temperature, this being a restricting factor for expansion of the species. Trees turn to vegetation after a period of 7-10 days with temperature higher than the biological threshold and the blooming and the forming of the fruits are realized it the temperature is reaching at least 10-12ºC. During the vegetation period the best temperature is of 20ºC. Endurance to lower temperatures depends on the vegetation phase and each organ. The trees well prepared for winter can resist to temperatures up to 26-27ºC without damage.

The buds in the phase of growing are destroyed at – 12ºC, -14 ºC, when petals appear, only some species resist at – 6 ºC, open flowers freeze at – 2ºC, -3ºC, and early fruit are affected at -1 , -2ºC. The water demands of the apricot trees are limited, they being able to do very well in the regions with 450-550 mm rainfalls per year. The apricot tree is one of the most pretentious species regarding the light. In order to ensure the necessary source of light, the apricot type is located on the most exposed soils, the shape of its top crows is chosen so that light can reach all the parts of the trunk, the direction of the lines is oriented towards north-south. Regarding the soil, the demands of this species are reasonable, it does well on most medium and light soils, it can't stand heavy soils or those with excess water, which is one of the apricot tree's premature death causes. The old type of apricot tree in the region of Oradea consisted in the following types: Big of Cenad, Royal, Luizet, Best of Hungary, Paviot species relatively sensitive at the variations of temperature at the beginning of the spring and not providing crops accordingly. In order to enrich the existing species, there were organized at S.C.P.P. Oradea experiments with contest crops to establish the most valuable species of this region.

MATERIALS AND METHODS

The biological material comprises 22 types of apricot trees, the experience was made in 1995 on a good, clayey soil with 30-40%, pH 5,5- 6,5 at a 4/4 m planting distance the mirobolan tree as lorated on the experimental grounds research of S.C.P.P Oradea. The climatic factors in 2005 were a yearly average temperature of 10,2 grade , and 780 mm yearly rainfall. In 2005 there weren't registered any climatic accidents, and as a result there being obtained good crops at the species referred to during the experiment.

RESULTS AND DISCUSSIONS

They made observations and measurements regarding the phases of the flowering, the growing stage of the fruit, the fruit crops and the surface of the section of the trunk.

Flowering at the species of apricot trees taken into consideration in the research took place between the 1 st and the 9 th of April presenting a maximum intensity of flowering for mark 5 (table 1.)

Table 1.

Phases of flowering and ripening stage of apricots in 2005

No. crt.	Ranges	Beginning of the flowering	End of flowering	Intensity of flowering	Crop ripen	
					Date	Number of days
1.	Mamaia	5.04	8.04	5	15-26.07	104
2.	Silvana	5.04	8.04	5	20-30.07	106
3.	Sirena	5.04	10.04	5	20-30.07	111
4.	Comandor	6.04	11.04	5	20.07	106
5.	Favorit	4.04	9.04	5	26-30.07	105
6.	Litoral	4.04	8.04	5	26-30.07	111
7.	Umberto	9.04	14.04	5	20-26.07	102
8.	Callatis	4.04	8.04	5	15-26.07	102
9	Excelsior	4.04	8.04	5	25.07	109
10.	Selena	4.04	8.04	5	5.07	98
11.	Olimp	5.04	8.04	5	15-20.07	100
12.	Goldrich	3.04	7.04	5	15-20.07	101
13.	Venus	3.04	7.04	5	15-20.07	99
14.	C.M.B de Ungaria	3.04	9.04	5	15.07	102
5.	Skaha	3.04	7.04	5	20-26.07	99
16.	Sulina	3.04	7.04	5	6-15.07	99
17.	Saturn	3.04	9.04	5	6-15.07	92
18.	CR 2-63	3.04	8.04	5	1.07	94
19.	Neptun	3.04	7.04	5	2.07	99
20	Sulmona	4.04	7.04	5	26.06-6.07	110
21.	Harcot	3.04	7.04	5	26.06-6.07	110
22.	NJA 19	3.04	7.04	5	26.06- 6.07	110

The end of flowering was between 7 th and 14 th of April. The earliest was Best of Hungary type 1st- 7 th of April and the last was Umberto 9 th-14 th of April.

The ripening of the fruit took place between the 26 th of June and the 30 th of July for the Harcot and NJA 19 types and between the 26 th- 30 th for Selena, Sulmona, Litoral, Callatis types. Fruit crop was between 15,5 kg tree for Goldrich type and 37,2 kg tre Comandor type. Very good crops were registered at the following types: Comandor (23,2 t/ha), Mamaia (20,0 t/ha), Favorit (19,4t/ha), Sirena (19,0 t/ha), poor crops were registered at Goldricch (9,7 t/ha), Sulmona (10,6 t/ha) types (table 2).

The surface of the trunk's section

In 2005, the 5th year from planting the surface of the trunk section was between 37,7 cm² at Neptun type and 91m5 cm² for Mamaia type (table 3). The average surface of the section of the trunk was 63,0 cm² and the types Mamaia, Umberto, Best of Hungary, Saturn, Sulina, Skaha, had the surface of the trunk's section larger than the witness with 8,3 cm² to 32,1 cm². The other 12 types having the surface of the t section smaller than that of the Witness, the difference between them is from – 0,2 cm² and- 25,3 cm².

Table 2

Fruit crops at the species of apricot trees

No crt	Range	Fruit crop kg/tree	Fruit crop t/ha	Difference compared to witness kg/tree	Difference compared to witness t/ha
1.	Mamaia	32,0	20,0	+9,7	+6,1
2.	Silvana	25,0	15,6	+2,7	+1,7
3.	Sirena	30,5	19,0	+8,2	+5,1
4.	Comandor	37,2	23,2	+14,9	+9,3
5.	Favorit	31,0	19,4	+8,7	+5,5
6.	Litoral	21,7	13,6	-0,6	-0,3
7.	Umberto	20,0	12,5	-2,3	-1,4
8.	Callatis	25,5	15,9	+3,2	+2,0
9.	Excelsior	20,0	12,5	-2,3	-1,4
Average (Witness of experiment)		22,3	13,9	-	-
10.	Selena	18,6	11,6	-3.7	-2,3
11.	Olimp	21,7	13,6	-o,6	-0,3
12.	Goldrich	15,5	9,7	-6,8	-4,2
13.	Venus	18,6	11,6	-3,7	-2,3
14.	The Best of Hungary	19,2	12,0	-3,1	-1,9
15.	Skaha	25,5	15,9	+3,2	+2,0
16.	Sulina	25,6	16,0	+3,3	+2,1
17.	Saturn	18,6	11,6	-3,7	-2,3
18.	CR 2-63	18,0	11,2	-4,3	-2,7
19.	Neptun	18,0	11,2	-4,3	-2,2
20.	Sulmona	17,0	10,6	-5,3	-3,3
21.	Harcot	18,0	11,2	-4,3	-2,7
22.	NJA 19	12,5	7,8	-9,8	-6,1

Table 3

The surface of the trunk,s section at the species of apricot trees studied in 2005

No crt	Ranges	Surface of the trunk's section	
		cm^2	Difference to the witness
1.	Mamaia	95,1	+32,2
2	Silvana	78,2	+15,2
3.	Sirena	76,9	-20,9
4.	Comandor	42,1	-20,9
5.	Favorit	74,6	+11,6
6.	Litoral	54,6	-8,4
7.	Umberto	92,1	+29,1
8.	Callatis	62,8	-0,2
9.	Excelsior	58,2	-4,8
10.	Selena	60,7	-2,3
Average (Witness of experiment)		63,0	-
11.	Olimp	48,2	-14,8
12.	Goldrich	43,2	-19,8
13.	Venus	53,1	-9,9
14.	The Best of Hungary	74,7	+11,7
15.	Skaha	71,3	+8,3
16.	Sulina	71,9	+8,9
17.	Saturn	73,9	+10,9
18.	CR 2-63	40,8	-22,2
19.	Neptun	37,7	-25,3
20.	Sulmona	50,9	-12,1
21.	Harcot	48,2	-14,8
22.	NJA 19	77,6	+14,6

CONCLUSIONS

The flowering took place in the 1 st and the 2 nd decade of April for about 4-5 days depending on the species.

The ripening of the fruit was placed at intervals during 30-31 days beginning with the last decade of June and going on until the last decade of Juky.

Among the species that have been studied, the most productive proved to be the Comandor with a crop of 37,2 kg/tree, Mamaia with 32,0 kf/ tree, Favorit with 31,0 kg/tree, being species with late ripening; the species with early ripening were haricot 18,0 kg/tree, CR 2-63 18,0 kg/tre.

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